

TABLE OF CONTENTS

DIVISION I – GENERAL PROVISIONS	1-1
(c100ai04) GENERAL PROJECT REQUIREMENTS 9-5-13 (SPCN)	1-3
(c100II2) VDOT SSs, SPs & SPCNs 12-1-11 (SPCN)	1-4
(c103i00) SECTION 103 AWARD AND EXECUTION OF CONTRACTS 11-20-13 (SPCN)	1-6
(c105is1) SECTION 105.06 SUBCONTRACTING 5-15-08 (SPCN)	1-7
(cu107000b) USE OF MINORITY BUSINESS ENTERPRISES (MBEs) 9-13-12b (SPCN).....	1-8
S100B00 PROJECT COMMUNICATION AND DECISION MAKING Re. 7-08.....	1-9
S107E03 VOC EMISSIONS CONTROL AREAS 12-18-13	1-13
S107G01 C-45–SWPPP GEN. PERMIT– CONTRACTOR & SUB. CERTIF. 2-19-09	1-15
SS1D016 SUPP. DIVISION I – GENERAL PROVISIONS 10-8-13	1-16
 DIVISION II – MATERIALS	 2-1
SS20702 SUPPLEMENTAL SECTION 207 – SELECT MATERIAL 2-19-14	2-3
SS20802 SUPPLEMENTAL SECTION 208 – SUBBASE AND AGGREGATE BASE MAT. 2-19-14 ...	2-4
SS21111 SUPPLEMENTAL SECTION 211 – ASPHALT CONCRETE 12-18-12.....	2-5
SS21402 SUPPLEMENTAL SECTION 214 – HYDRAULIC CEMENT 1-28-08	2-14
SS21501 SUPPLEMENTAL SECT. 215 – HYDR. CEMENT CONC. ADMIXTURES 1-28-08	2-15
SS21706 SUPPLEMENTAL SECTION 217 – HYDRAULIC CEMENT CONCRETE 7-29-13	2-16
SS22401 SUPPLEMENTAL SECTION 224 – CASTINGS 11-15-07	2-27
SS23203 SUPPLEMENTAL SECTION 232 – PIPE AND PIPE ARCHES 5-17-12	2-28
SS23802 SUPPLEMENTAL SECT. 238 – ELECTRICAL AND SIGNALS COMPONENTS 3-4-08	2-29
SS24701 SUPPLEMENTAL SECTION 247 – REFLECTIVE SHEETING 02-10-11.....	2-31
 DIVISION III – ROADWAY CONSTRUCTION	 3-1
(c302h00) SECTION 302.03(b) PRECAST DRAINAGE STRUCTURES 1-14-08 (SPCN).....	3-3
S302B00 RESTORING EXISTING PAVEMENT 1-14-08cc.....	3-4
S302G02 FLOWABLE BACKFILL 3-11-10.....	3-6
S310AM3 NONTRACKING TACK COAT 10-5-10c	3-8
S315LM2 SURFACE PREPARATION AND RESTORATION PRIOR TO OVERLAY 2-2-11	3-10
S315NM4 PLACEMENT OF ASPHALT CONCRETE OVERLAYS 9-27-11	3-12
S315QM1 LIMITS OF MAINLINE OVERLAY AT INTERSECTIONS TO PAVED ROADS 7-28-10.....	3-17
SS30204 SUPPLEMENTAL SECTION 302 – DRAINAGE STRUCTURES 3-14-13	3-19
SS30305 SUPPLEMENTAL SECTION 303 – EARTHWORK 5-20-11c	3-28
SS31508 SUPPLEMENTAL SECTION 315 – ASPHALT CONCRETE PLACEMENT 10-22-12	3-31
 DIVISION V – INCIDENTAL CONSTRUCTION	 5-1
(c510am1) LOC/REMOVE/DISPOSE – RAISED/RECESS PAVE MARKERS 10-17-10 (SPCN)	5-3
(c512hg0) CONTRACTOR PROPOSED ALT. TRAFFIC CONTROL PLANS Re. 7-08 (SPCN)	5-4
S504B01 CG-12 DETECTABLE WARNING SURFACE 9-18-13.....	5-5
S512MG0 SECTION 512 – MAINTAINING TRAFFIC – NON-SCHEDULES (LUMP SUM) 6-25-10c.....	5-7
S522B00 SECTION 522 – INFORMAL PARTNERING 1-14-08.....	5-11
SS51202 SUPPLEMENTAL SECTION 512 – MAINTAINING TRAFFIC 6-11-09.....	5-13
SS51505 SUPPLEMENTAL SECTION 515 – PLANING OR MILLING PAVEMENT 9-27-11	5-15
SU503000A RIGHT-OF-WAY MONUMENT AND FINAL BOUNDARY STAKEOUT 12-2-09a	5-19
 DIVISION VII – TRAFFIC CONTROL DEVICES	 7-1
(c700i00) SECTION 700 GENERAL 2-21-13 (SPCN)	7-3
(cu703000a) SAW CUT 10-2-08a (SPCN).....	7-6
S704M03 TEMPORARY CONSTRUCTION AND PERMANENT PAVEMENT MARKINGS 9-28-12	7-7
SS70004 SUPPLEMENTAL SECTION 700 – GENERAL 2-21-13	7-15
SS70102 SUPPLEMENTAL SECTION 701 – TRAFFIC SIGNS 1-22-09c	7-22
SS70301 SUPPLEMENTAL SECTION 703 – TRAFFIC SIGNALS 1-6-09	7-23
SS70401 SUPPLEMENTAL SECTION 704 – PVMNT MARKINGS & MARKERS 10-14-11	7-24

SU704000B PREFORMED THERMOPLASTIC PAVEMENT MARKINGS 11-29-11b.....	7-25
---------------------------------------------------------------------------	-------------

PROJECT SPECIFIC PROVISIONS AND STANDARD SPECIFICATION MODIFICATIONS	1
Aggregate Reinforced Thermoplastic Pavement Marking.....	2
Utility Test Holes	4
Water Quality Structure.....	5
Sec 303 - Inlet Protection Type C	8
Sec 309 - Aggregate Base Course and Asphalt Concrete Pavement.....	9
Sec 510 - Removal and Salvage of Traffic Signal Equipment	10
Sec 700/703 - Traffic Signal.....	12
City Provided Signs	37
Emergency Vehicle Preemption	38
Video Detection	40
Fiber Optic Communications.....	41

APPENDICES

 Geotechnical Report – March 24, 2014

Plan Set Identified As: North King Street / Little Back River Road Intersection Improvements
Dated August 8, 2014 (under Separate Cover)

— **DIVISION I – GENERAL PROVISIONS** —

**SPECIAL PROVISION COPIED NOTES (SPCNs), SPECIAL PROVISION (SPs) and
SUPPLEMENTAL SPECIFICATIONS (SSs)**

— **STANDARD 100 SERIES SPCNs, SPs, and SSs** —

(c100ai04-0114)

GENERAL PROJECT REQUIREMENTS, SUPPLEMENTAL SPECIFICATIONS (SSs), SPECIAL PROVISIONS (SPs) AND SPECIAL PROVISION COPIED NOTES (SPCNs)

This project shall be constructed in accordance with: the plans; the *Virginia Department of Transportation Road and Bridge Specifications*, dated 2007; the *Virginia Department of Transportation Road and Bridge Standards*, dated 2008; the 2011 edition of the *Virginia Work Area Protection Manual*; the 2009 edition of the *MUTCD* with Revision Numbers 1 and 2 incorporated, dated May 2012 and the 2011 edition of the *Virginia Supplement to the MUTCD with Revision Number 1* dated September 30, 2013; and the Supplemental Specifications, Special Provisions and Special Provision Copied Notes in this contract. The status in the contract of each of these documents will be in accordance with Section 105.12 of the Specifications.

Special Provision Copied Notes in this contract are designated with “(SPCN)” after the date.

The information enclosed in parenthesis “()” at the left of each Special Provision Copied Note in this contract is file reference information for Department use only. The information in the upper left corner above the title of each Supplemental Specification and Special Provision in this contract is file reference information for Department use only.

The Department has identified the system of measurement to be used on this particular project as imperial. Any imperial unit of measure in this contract with an accompanying expression in a metric unit shall be referred to hereinafter as a “dual unit” measurement. Such a “dual unit” measurement is typically expressed first in the imperial unit followed immediately to the right by the metric unit in parenthesis “()” or brackets “[]” where parenthesis is used in the sentence to convey other information. Where a “dual unit” of measure appears in this project, only the imperial unit shall apply. The accompanying metric unit shown is not to be considered interchangeable and mathematically convertible to the imperial unit and shall not be used as an alternate or conflicting measurement.

9-5-13 (SPCN)

VDOT SUPPLEMENTAL SPECIFICATIONS (SSs), SPECIAL PROVISIONS (SPs) AND SPECIAL PROVISION COPIED NOTES (SPCNs)

Where Virginia Department of Transportation (VDOT) Supplemental Specifications, Special Provisions and Special Provision Copied Notes are used in this contract, the references therein to “the Specifications” shall refer to the *Virginia Department of Transportation Road and Bridge Specifications*, dated 2007 for both imperial and metric unit projects. References to the “Road and Bridge Standard(s)” shall refer to the *Virginia Department of Transportation Road and Bridge Standards*, dated 2008 for both imperial and metric unit projects. References to the “Virginia Work Area Protection Manual” shall refer to the 2011 edition of the *Virginia Work Area Protection Manual* for imperial and metric unit projects. References to the “MUTCD” shall refer to the 2009 edition of the *MUTCD* and the current *Virginia Supplement to the MUTCD* for imperial and metric unit projects.

Where the terms “Department”, “Engineer” and “Contract Engineer” appear in VDOT Supplemental Specifications, Special Provisions and Special Provision Copied Notes used in this contract and the VDOT publication(s) that each references, the authority identified shall be in accordance with the definitions in Section 101.02 of the *Virginia Department of Transportation Road and Bridge Specifications*, dated 2007. Authority identified otherwise for this particular project will be stated elsewhere in this contract.

VDOT Supplemental Specifications, Special Provisions and Special Provision Copied Notes used in this contract and the VDOT publication(s) that each reference are intended to be complementary to the each other. In case of a discrepancy, the order of priority stated in Section 105.12 of the *Virginia Department of Transportation Road and Bridge Specifications*, dated 2007 shall apply.

VDOT Special Provision Copied Notes in this contract are designated with “(SPCN)” after the date of each document. VDOT Supplemental Specifications and Special Provision Copied Notes in this contract are designated as such above the title of each document.

The information enclosed in parenthesis “()” at the left of each VDOT Special Provision Copied Note in this contract is file reference information for VDOT use only. The information in the upper left corner above the title of each VDOT Supplemental Specification and VDOT Special Provision in this contract is file reference information for VDOT use only.

The system of measurement to be used in this project is stated elsewhere in this contract. VDOT Supplemental Specifications, Special Provisions and Special Provision Copied Notes containing imperial units of measure with accompanying expressions in metric units shall be referred to hereinafter as “dual unit measurement” documents. Such a “dual unit measurement” is typically expressed first in the imperial unit followed immediately to the right by the metric unit in parenthesis “()” or brackets “[]” where parenthesis is used in the sentence to convey other information. Where a “dual unit measurement” appears in VDOT documents, the unit that applies shall be in accordance with the system of measurement as stated elsewhere in this contract. The unit shown that is not of the declared unit of measurement is not to be considered interchangeable and mathematically convertible to the declared unit and shall not be used as an alternate or conflicting measurement. Where VDOT Specifications are used for metric unit projects

and only imperial units of measurement appear the document, the provision(s) in this contract for imperial unit to metric unit conversion shall apply.

12-1-11 (SPCN)

SECTION 103—AWARD AND EXECUTION OF CONTRACTS of the Specifications is amended as follows:

Section 103.09—Execution of Contract is amended to include the following:

According to Section 2.2-4308.2 of the *Code of Virginia*, any employer with more than an average of 50 employees for the previous 12 months entering into a contract in excess of \$50,000 with the Department to provide work or provide services pursuant to such contract shall register and participate in the U.S. Department of Homeland Security's "E-Verify" system to verify information and work authorization of its newly hired employees performing work pursuant to such contract.

Contractors are not required to be enrolled with "E-Verify" at the time bids are submitted, however, prior to award, the lowest responsive and responsible bidder must be enrolled with "E-Verify". Contractors may use the following website to enroll in "E-Verify", <http://www.uscis.gov/e-verify>.

Contractors shall expressly require any subcontractors performing work or providing services pursuant to the Contract to likewise utilize the U.S. Department of Homeland Security's "E-Verify" system to verify the employment eligibility of all new employees hired by the subcontractor during the Contract term.

Bidders or Contractors who fail to comply with the provisions of this section shall be debarred from contracting with any agency of the Commonwealth for a period up to one year. Such debarment shall cease upon registration and participation in the "E-Verify" program.

11-20-13 (SPCN)

(c105is1-0908)

SECTION 105.06 SUBCONTRACTING of the Specifications is amended to replace the first paragraph with the following:

No portion of the Contract shall be subcontracted or otherwise disposed of without the written consent of the Engineer, except for work that is \$25,000 or less per subcontractor, where the cumulative total of the sublets not requiring the Engineer's written consent will not exceed 10 percent of the original contract value. This will not, however, waive the requirements for prequalification, and will be considered part of the percentage the Contractor is allowed to subcontract. The Contractor shall notify the Engineer of the name of the firm to whom the work will be subcontracted, and the amount and items of work involved. Such notification shall be made and verbal approval given by the Engineer prior to the subcontractor beginning work.

5-15-08 (SPCN)

USE OF MINORITY BUSINESS ENTERPRISES (MBEs) - In accordance with Section 107.15—Use of Minority Business Enterprises of the Specifications, the Contractor is encouraged to provide opportunities to MBEs and SWaMs to provide services for hauling, placement of pavement markings, traffic control items and any other work operations required by this contract.

9-13-12b (SPCN)

VIRGINIA DEPARTMENT OF TRANSPORTATION
SPECIAL PROVISION FOR
PROJECT COMMUNICATION AND DECISION MAKING

January 3, 2005c
Reissued July 2008

I. DESCRIPTION

The intent of this provision is to establish procedures, processes and guidelines for making decisions and managing communications regarding work under contract on construction and maintenance projects. The information contained herein is not meant to be all inclusive but to serve as a minimal general framework for promoting efficient and effective communication and decision making at both the project and, if needed, executive administrative level. It is also not meant to override the decision-making processes or timeframes of specific contract requirements.

II. DEFINITIONS

For the purposes of this provision the following terms will apply and be defined as follows:

Submittals – Documents required by the contract that the Contractor must submit for the Department's review, acceptance or approval. These may include shop drawings, working drawings, material test reports, material certifications, project progress schedules, and schedule updates. The Contractor shall produce submittals as early as practicable when required by the contract so as not to delay review and determination of action.

Confirmation of verbal instructions (COVI) - Contractor requested written confirmation of agreements and instructions developed in negotiations with the Department concerning the Work under contract. Agreements must be able to be quantified using existing contract procedures and will, in the vast majority of cases, not impact contract time and cost. When time and/or cost are impacted, they must be clearly spelled out in the COVI.

Requests for information (RFI) – Requests generated by either the Contractor or the Department that the other party supplies information to better understand or clarify a certain aspect of the Work.

Requests for owner action (ROA) – Requests when the Contractor asks that the Department take certain action(s) the Contractor feels is required for proper completion of a portion of the Work or project completion.

Contract change requests (CCR) - Request where the Contractor asks the Department to make an equitable adjustment to the contract because of excusable and/or compensable events, instructions that have or have not been given or other work requiring time and/or cost beyond that specified or envisioned within the original contract.

Requests for contractor action (RCA) – Request generated by the Department where the Department asks the Contractor to take certain action that is in the best interests of the project and/or is required for proper completion of a portion of the Work or for project completion.

Contract change directives (CCD) – Directive by the Department which instructs the Contractor to perform work beyond that specified or envisioned in the original contract and which may specify instructions, time, and cost(s) to make an equitable adjustment to the original contract.

Responsible Person – The individual in the normal or escalated resolution process, for either the Contractor or the Department, having the direct authority, responsibility and accountability to formulate and respond to each category of information request.

III. PROCESS FOR DECISION MAKING

Project teams composed on responsible individuals directly involved in the administration, prosecution, and inspection of the Work from the Contractor and the Department shall define and agree upon the field decision-making process during the pre-construction conference. This information relative to the process should be written down and distributed to all parties of the process once it is established. Where there are responsibility, authority or personnel changes associated with this process such changes shall be distributed to all affected parties as quickly as practicable after they are effective so as not to delay or impede this process.

The process for making field decisions with respect to the Work detailed in the contract basically requires the following steps:

1. The Contractor and the Engineer agree on the decision-making process, the identity, authority and accountability of the individuals involved and on the cycle times for response for each category of decision.
2. The party requiring the information generates the appropriate request documents, and calls for a decision from the individual who is accountable for the particular facet of the Work under consideration within the agreed period.
3. The responding party has an internal decision-making process that supports the individual who is accountable and provides the information required within the agreed period for each category of request.
4. The party receiving the decision has an internal process for accepting the decision or referring it for further action within an agreed period of time.

The process also requires that clear and well-understood mechanisms be in place to log and track requests, document the age and status of outstanding requests and actions to be taken on requests that have not been answered within the agreed period.

Both the Department and the Contractor shall agree on the following:

- The documentation and perhaps format to be developed for each category of information requested,
- The name (as opposed to organizational position) of all individuals with the responsibility, authority and accountability to formulate and respond to each category of information requested. The District Administrator (DA) or Chief Executive Officer (CEO) of the Contractor may delegate the responsibility and authority for formulating and responding to requests, however, the accountability for meeting the established response time(s) remains with the District Administrator and CEO.
- The cycle times for each stage in the decision-making process,
- The performance measures to be used to manage the process,
- The action to be taken if cycle times are not achieved and information is not provided in a timely manner.

The following general guideline and timeframe matrix will apply to the various requests for action. Again, please note these guidelines are general in scope and may not apply to specific contract timeframes for response identified within the requirements of the Contract documents. In such cases, specific contract requirements for information shall apply.

PROCESS GUIDELINES FOR REQUESTS GENERATED BY THE CONTRACTOR

Process	Situation	Normal resolution process		Escalated process		Final resolution
		By	Within (calendar days)	By	Within	
Submittal	Where the Contractor requests the Department's review, acceptance or approval of shop drawings, materials data, test reports, project progress schedules, or other submittals required by standard Specifications or other contract language.	Department's Designated Project Manager	<ul style="list-style-type: none"> • Acknowledge: 3 days¹ • Accept or Return: 14 days • Final Determination\Approve: 30 days or as outlined in contract documents. 	DA or their designee*	7 days	Submit ROA or CCR
Confirmation of Verbal Instruction (COVI)	Resolving routine field issues, within the framework of the Contract, in negotiation with Owner field personnel.	Department's Appropriate field personnel	<ul style="list-style-type: none"> • Confirmation: 1 day² 	Submit RFI, ROA or CCR	7 days	(See process for RFI, ROA, or CCR)
Request for Information (RFI)	Requests the Department to supply information to better understand or clarify a certain aspect of the work.	Department's Designated Project Manager	<ul style="list-style-type: none"> • Action: 14 days (or appropriate Action Plan) 	DA or their designee*	7 days	Submit ROA or CCR
Request for Owner Action (ROA)	Requests that the Department take certain action the Contractor feels is required for proper completion of a portion of the Work or project completion.	Department's Designated Project Manager	<ul style="list-style-type: none"> • Acknowledge: 3 days¹ • Action: 14 days (or appropriate Action Plan) 	DA or their designee*	7 days	Submit CCR
Contract Change Request (CCR)	Requests the Department to make an equitable adjustment to the contract because of excusable and/or compensable events, instructions that have or have not been given or other work requiring time and/or cost beyond that specified or envisioned within the original contract.	Department's Designated Project Manager	<ul style="list-style-type: none"> • Acknowledge: 3 days¹ • Action: 30 days (45 days if federal oversight project) 	DA or their designee*	7 days	Established dispute resolution and claims process

¹ Process initiated on the last business day of a week shall be acknowledged before 5 pm on the next VDOT business day.

² The absence of a written confirmation from the Owner to a Contractor's written request for confirmation of a verbal instruction shall constitute confirmation of the verbal instruction.

PROCESS GUIDELINES FOR REQUESTS GENERATED BY THE OWNER

Process	Situation	Normal resolution process		Escalated process		Final resolution
		By	Within (calendar days)	By	Within	
1. RFI	Requests the Contractor to supply information to better understand or clarify a certain aspect of the work. (RFI)	Contractor's Project Superintendent	<ul style="list-style-type: none"> Action: 14 days (or appropriate written Action Plan) 	Contractor's Project Manager	7 days	Submit RCA or CCD
2. RCA	Requesting the Contractor take certain action(s) that is in the best interests of the project and/or is required for proper completion of a portion of the work or for project completion. (RCA)	Contractor's Project Superintendent	<ul style="list-style-type: none"> Response or Action to safety and environmental issues: 1 day Otherwise acknowledge: 3 days¹ Action: 14 days (or appropriate Action Plan) 	Contractor's Project Manager	7 days	Submit CCD
3. CCD	Instructs the Contractor to perform work beyond that specified or envisioned in the original contract and undertakes action(s) to make an equitable adjustment to the contract. (CCD)	Contractor's Project Superintendent	<ul style="list-style-type: none"> Acknowledge: 3 days¹ Action: 30 days 	CEO or their designee**	7 days	Established dispute resolution and termination process

¹ Process initiated on the last business day of a week shall be acknowledged before 5 p m on next project business day.

VIRGINIA DEPARTMENT OF TRANSPORTATION
SPECIAL PROVISION FOR
VOLATILE ORGANIC COMPOUND (VOC) EMISSIONS CONTROL AREAS

December 18, 2013

VOC Emission Control Area - The Contractor is advised that this project may be located in a volatile organic compound (VOC) emissions control area identified in the State Air Control Board Regulations (9 VAC 5-20-206) and in Table 1 below. Therefore, the following limitations may apply:

- Open burning is prohibited during the months of May, June, July, August, and September in VOC Emissions Control areas
- Cutback asphalt is prohibited April through October except when use or application as a penetrating prime coat or tack is necessary in VOC Emissions Control areas

Table 1. Virginia Department of Environmental Quality Volatile Organic Compound (VOC) Emissions Control Areas*

VOC Emissions Control Area	VDOT District	Jurisdiction
Northern Virginia	NOVA	Alexandria City Arlington County Fairfax County Fairfax City Falls Church City Loudoun County Manassas City Manassas Park City Prince William County
Northern Virginia	Fredericksburg	Stafford County
Fredericksburg	Fredericksburg	Spotsylvania County Fredericksburg City
Hampton Roads	Fredericksburg	Gloucester County
Hampton Roads	Hampton Roads	Chesapeake City Hampton City Isle of Wight County James City County Newport News City Norfolk City Poquoson City Portsmouth City Suffolk City Virginia Beach City Williamsburg City York County

Richmond	Richmond	Charles City County Chesterfield County Colonial Heights City Hanover County Henrico County Hopewell City Petersburg City Prince George County Richmond City
Western Virginia	Staunton	Frederick County Winchester City
Western Virginia	Salem	Roanoke County Botetourt County Roanoke City Salem City

* Regulations for the Control and Abatement of Air Pollution (9 VAC 5-20-206)

See the Virginia Code 9 VAC 5-45, Article 7 (Emission Standards for Asphalt Paving Operations) and 9 VAC 5-130 (Regulation for Open Burning) for further clarification. In addition to the above requirements, the Contractor's attention is directed to the requirements of Section 107.16 of the Specifications, because other air pollution requirements may also apply.

VIRGINIA DEPARTMENT OF TRANSPORTATION

**STORMWATER POLLUTION PREVENTION PLAN (SWPPP) GENERAL PERMIT FOR THE
DISCHARGE OF STORMWATER FROM CONSTRUCTION ACTIVITIES CONTRACTOR AND
SUBCONTRACTOR CERTIFICATION STATEMENT**

Order No.: _____ Project Number: _____

Route: _____ Contract ID. #: _____

I certify under penalty of law that I understand the terms and conditions of the project contract, plans, permits, specifications and standards related to the erosion and sediment control, stormwater management and stormwater pollution prevention plan requirements for the affected activities associated with this project, the Virginia Stormwater Management Program (VSMP), and the General Permit for the Discharge of Stormwater from Construction Activities, if applicable to this project, issued by the Virginia Department of Conservation and Recreation. The VSMP Permit authorizes the storm water discharges associated with the construction activities from the project site identified and described in the bid documents and subsequent contract including any off-site support activities required for the complete fulfillment of the work therein.

Signature: _____

Name: _____

Title: _____

Contracting Firm: _____

Address: _____

Phone Number: _____

Address/Description of Site: _____
(Include off-site areas) _____

Certified on this date: _____

(Note: This form must be returned with performance and payment bonds)

VIRGINIA DEPARTMENT OF TRANSPORTATION
2007 ROAD AND BRIDGE SUPPLEMENTAL SPECIFICATIONS

SUPPLEMENTAL DIVISION I—GENERAL PROVISIONS

SECTION 101—DEFINITIONS OF ABBREVIATIONS, ACRONYMS, AND TERMS

Section 101.02—Terms of the Specifications is amended to replace the definition for **Notice to Proceed** with the following:

Notice to Proceed. A date selected by the Contractor that is no earlier than 15 nor later than 30 calendar days after the date of contract execution on which the Contractor intends to begin the work, or a contract specific date on which the Contractor may begin the work identified as the Notice to Proceed date in the Contract Documents.

Section 101.02—Terms of the Specifications is amended to add the following:

Storm Sewer System - A drainage system consisting of a series of at least two interconnecting pipes and structures (minimum of two drop inlets, manholes, junction boxes, etc.) designed to intercept and convey stormwater runoff from a specific storm event without surcharge.

SECTION 102—BIDDING REQUIREMENTS AND CONDITIONS

Section 102.01—Prequalification of Bidders of the Specifications is amended to replace the first paragraph of (a) with the following:

All prospective Bidders, including all members of a joint venture, must prequalify with the Department and shall have received a certification of qualification in accordance with the Rules Governing Prequalification Privileges prior to bidding. These rules and regulations can be found within the Department's Rules Governing Prequalification Privileges via the Prequalification Application. This requirement may be waived by a project-specific provision in the bid proposal.

All subcontractors must be prequalified prior to performing any work on the contract, except that prequalification will not be required for subcontractors only performing a service as defined by the Code of Virginia, or only performing work items noted in the proposal as "Specialty Items".

In order to be eligible for DBE credit under Special Provision for Section 107.15, DBE federal-aid contract subcontractors must be VDOT prequalified and DMBE certified at the time of bid submission. The prequalification and certification status of a DBE may affect the award of the contract to the prime contractor and the award of the subcontract to the DBE at any point during the contract.

Section 102.04(c) Notice of Alleged Ambiguities of the Specifications is amended to replace the first paragraph with the following:

If a word, phrase, clause, or any other portion of the proposal is alleged to be ambiguous, the Bidder shall submit to the State Contract Engineer a written notice of the alleged ambiguity not later than 10 days prior to the date of receipt of bids and request an interpretation thereof. This written notice shall be submitted via the CABB (Contractor Advertisement Bulletin Board) system located on the Construction website at www.VDOT.Virginia.gov. Authorized interpretations will be issued by the State Contract Engineer to each person who received a proposal and will be posted on the CABB system.

Section 102.11— eVA Business-To-Government Vendor Registration of the Specifications is replaced with the following:

Bidders are not required to be registered with "eVA Internet e-procurement solution" at the time bids are submitted, however, prior to award, the lowest responsive and responsible bidder must be registered with "eVA Internet e-procurement solution" or the bid will be rejected. Registration shall be performed by accessing the eVA website portal www.eva.state.va.us, following the instructions and complying with the requirements therein.

When registering with eVa it is the bidder's responsibility to enter or have entered their correct PA type address or addresses in eVa in order to receive payments on any contracts that the Department (VDOT) may award to them as the lowest responsive and responsible bidder. The Bidder shall also ensure their prequalification address(es) match those registered with eVa. Failure on the part of the bidder or Contractor to meet either of these requirements may result in late payment of monthly estimates.

SECTION 105—CONTROL OF WORK

Section 105.01—Notice to Proceed of the Specifications is replaced with the following:

Unless otherwise indicated in the Contract, the Notice to Proceed date will be the date selected by the Contractor on which the Contractor intends to begin the work. That date shall be no earlier than 15 nor later than 30 calendar days after the date of contract execution. The State Contract Engineer will contact the Contractor on the date of contract execution to inform him that the contract has been executed. The State Contract Engineer will also confirm this date in the Letter of Contract Execution. Copies of the Letter of Contract Execution will be distributed to Department personnel involved in the administration of the Contract and to the Contractor. Within 10 calendar days after the date of contract execution the Contractor shall submit to the Engineer written notice of the date he has selected as his Notice to Proceed date. If the Contractor fails to provide written notice of his selected Notice to Proceed Date within 10 calendar days of contract execution, the selected Notice to Proceed Date will become the date 15 calendar days after the date of contract execution. The Contractor shall begin work no later than 10 calendar days after the date he has selected as his Notice to Proceed date, unless the Notice to Proceed date is otherwise indicated in the Contract, in which case the Contractor shall begin work within 10 calendar days after the specific Notice to Proceed date indicated in the Contract.

Contract Time will commence on the date of the Notice to Proceed. The Letter of Contract Execution will identify the Chief Engineer's authorized representative, hereafter referred to as the Engineer, who is responsible for written directives and changes to the Contract. The Engineer will contact the Contractor after notice of award to arrange a pre-construction conference.

In the event the Contractor, for matters of his convenience, wishes to begin work earlier than 15 calendar days or later than 30 calendar days after the date of contract execution, he shall make such a request in writing to the Engineer within 10 calendar days of the date of contract execution or once a Notice to Proceed Date has been established, if he wishes to begin work more than 10 calendar days after his selected Notice to Proceed date or the Notice to Proceed Date indicated in the Contract, he shall make such a request to the Engineer in writing no later than 5 calendar days after the Notice to Proceed date. If this requested start date is acceptable to the Department, the Contractor will be notified in writing; however, the Contract fixed completion date will not be adjusted but will remain binding. The Contractor's request to adjust the start date for the work on the Contract will not be considered as a basis for claim that the time resulting from the Contractor's adjusted start date, if accepted by the Engineer, is insufficient to accomplish the work nor shall it relieve the Contractor of his responsibility to perform the work in accordance with the scope of work and requirements of the Contract. In no case shall work begin before the Department executes the Contract or prior to the Notice to Proceed date unless otherwise permitted by the Contract or

authorized by the Engineer. The Contractor shall notify the Engineer at least 24 hours prior to the date on which he will begin the work.

Section 105.02—Pre-Construction Conference of the Specifications is amended to replace the first paragraph with the following:

After notification of award and prior to the Notice to Proceed date the Contractor shall attend a pre-construction conference scheduled by the Engineer to discuss the Contractor's planned operations for prosecuting and completing the work within the time limit of the Contract. At the pre-construction conference the Engineer and the Contractor will identify in writing the authorities and responsibilities of project personnel for each party. The pre-construction conference may be held simultaneously with the scheduling conference when the Engineer so indicates this in advance to the Contractor. When these are simultaneously held, the Contractor shall come prepared to discuss preparation and submittal details of the progress schedule in accordance with the requirements of the Contract.

Section 105.10(c)(1)—Steel Structures of the Specifications is replaced with the following:

Working drawings for steel structures, including metal handrails, shall consist of shop detail, erection, and other working drawings showing details, dimensions, sizes of units, and other information necessary for the fabrication and erection of metal work.

Section 105.14—Maintenance During Construction of the Specifications is amended to add the following:

The Contractor shall provide at least one person on the project site during all work operations who is currently verified either by the Department in Intermediate Work Zone Traffic Control, or by the American Traffic Safety Services Association (ATSSA) as a Traffic Control Supervisor (TCS). This person must have the verification card with them while on the project site. This person shall be responsible for the oversight of work zone traffic control within the project limits in compliance with the contract requirements involving the plans, specifications, the VWAPM, and the MUTCD. This person's duties shall include the supervision of the installation, adjustment (if necessary), inspection, maintenance and removal when no longer required of all traffic control devices on the project.

If none of the Contractor's on-site personnel responsible for the supervision of such work has the required verification with them or if they have an outdated verification card showing they are not currently verified either by the Department in Intermediate Work Zone Traffic Control, or by the American Traffic Safety Services Association (ATSSA) as a Traffic Control Supervisor (TCS) all work on the project will be suspended by the Engineer.

The Contractor shall provide at least one person on site who is, at a minimum, verified by the Department in Basic Work Zone Traffic Control for each construction and/or maintenance operation that involves installing, maintaining, or removing work zone traffic control devices. This person shall be responsible for the placement, maintenance and removal of work zone traffic control devices.

In the event none of the Contractor's on-site personnel of any construction/maintenance operation has, at a minimum, the required verification by the Department in Basic Work Zone Traffic Control, that construction/maintenance operation will be suspended by the Engineer until that operation is appropriately staffed in accordance with the requirements herein.

Section 105.15(b) Mailboxes and Newspaper Boxes of the Specifications is replaced with the following:

(b) **Mailboxes and Newspaper Boxes:** When removal of existing mailboxes and newspaper boxes is made necessary by construction operations, the Contractor shall place them in temporary locations so that access to them will not be impaired. Prior to final acceptance, boxes shall be placed in their permanent locations as designated by the Engineer and left in as good condition as when found. Boxes or their supports that are damaged through negligence on the part of the

Contractor shall be replaced at his expense. The cost of removing and resetting existing boxes shall be included in other pay items of the Contract. New mailboxes designated in the plans shall be paid for in accordance with the provisions of Section 521 of the Specifications.

SECTION 107—LEGAL RESPONSIBILITIES

Section 107.02—Permits, Certificates, and Licenses of the Specifications is amended to replace (f) with the following:

- (f) **Virginia Department of Conservation and Recreation – Virginia Stormwater Management Program General Permit For Discharge of Stormwater From Construction Activities (VSMP Construction Permit):** All construction activities undertaken by or for VDOT must be covered by the VSMP Construction Permit. According to IIM-LD-242 and Section 107.16, VDOT is responsible for securing VSMP Construction Permit coverage for all applicable land disturbing activities performed on VDOT rights of way or easements, including off-site support facilities that are located on VDOT rights of way or easements that directly relate to the construction site. The Contractor shall be responsible for securing VSMP Construction Permit coverage for support facilities that are not located on VDOT rights of way or easements.

The Contractor shall be responsible for all costs to obtain VSMP Construction Permit coverage for all support facilities not included in the construction plans for the project. The Department will not be responsible for any inconvenience, delay, or loss experienced by the Contractor as a result of his failure to gain access to any support facility areas at the time contemplated.

Section 107.13—Labor and Wages of the Specifications is amended to add the following:

- (c) **Job Service Offices:** In advance of the Contract starting date, the Contractor may contact the Job Service Office of the Virginia Employment Commission at the nearest location to secure referral of available qualified workers in all occupational categories. The closest office may be obtained by accessing the VEC website at <http://www.vec.virginia.gov/vec-local-offices>.

Section 107.14(f) Training of the Specifications is amended to replace 5 and 6 with the following:

5. If the Contract provides a pay item for trainees, training shall be in accordance with the requirements of Section 518 of the Specifications.

Section 107.16(a) Erosion and Siltation of the Specifications is amended to replace the fourth paragraph with the following:

For projects that disturb 10,000 square feet or greater of land or 2,500 square feet or greater in Tidewater, Virginia, the Contractor shall have within the limits of the project during land disturbance activities, an employee certified by the Department in Erosion and Sediment control who shall inspect erosion and siltation control devices and measures for proper installation and operation and promptly report their findings to the Inspector. Inspections shall include all areas of the site disturbed by construction activity and all off site support facilities covered by the project's Stormwater Pollution Prevention Plan. Inspections shall be conducted at least once every 14 calendar days and within 48 hours following any runoff producing storm event (Note: If an inspection is conducted as a result of a storm event, another inspection is not required for 14 calendar days following provided there are no more runoff producing storm events during the that period). For those areas that have been temporarily stabilized or runoff is unlikely to occur due to winter conditions (e.g., the site is covered with snow or ice or frozen ground exists), inspections shall be conducted at least once a month. Those definable areas where final stabilization has been achieved will not require further inspections provided such areas have been identified in the project's Stormwater Pollution Prevention Plan. Failure of the Contractor to maintain a certified employee within the limits of the project will result in the Engineer suspending work related to any

land disturbing activity until such time as a certified employee is present on the project. Failure on the part of the Contractor to maintain appropriate erosion and siltation control devices in a functioning condition may result in the Engineer notifying the Contractor in writing of specific deficiencies. Deficiencies shall be corrected immediately. If the Contractor fails to correct or take appropriate actions to correct the specified deficiencies within 24 hours after receipt of such notification, the Department may do one or more of the following: require the Contractor to suspend work in other areas and concentrate efforts towards correcting the specified deficiencies, withhold payment of monthly progress estimates, or proceed to correct the specified deficiencies and deduct the entire cost of such work from monies due the Contractor. Failure on the part of the Contractor to maintain a Department certified erosion and sediment control employee within the project limits when land disturbance activities are being performed will result in the Engineer suspending work related to any land disturbance activity until such time as the Contractor is in compliance with this requirement.

Section 107.16(e) Storm Water Pollution Prevention Plan of the Specifications is replaced with the following:

(e) Storm Water Pollution Prevention Plan and Virginia Stormwater Management Program General Permit for the Discharge of Stormwater from Construction Activities

A Stormwater Pollution Prevention Plan (SWPPP) identifies potential sources of pollutants which may reasonably be expected to affect the stormwater discharges from the construction site and any on-site or off-site support facilities located on VDOT rights of way and easements. The SWPPP also describes and ensures implementation of practices which will be used to reduce pollutants in such discharges.

The SWPPP shall include, but not be limited to, the approved Erosion and Sediment Control (ESC) Plan, the approved Stormwater Management (SWM) Plan and related Specifications and Standards contained within all contract documents and shall be required for all land-disturbing activities that disturb 10,000 square feet or greater, or 2,500 square feet or greater in Tidewater, Virginia.

Land-disturbing activities that disturb one acre or greater, or 2,500 square feet or greater in an area designated as a Chesapeake Bay Preservation Area, require coverage under the Department of Conservation and Recreation's Virginia Stormwater Management Program (VSMP) General Permit for the Discharge of Stormwater from Construction Activities (hereafter referred to as the VSMP Construction Permit). According to IIM-LD-242, VDOT will apply for and secure VSMP Construction Permit coverage for all applicable land disturbing activities on VDOT rights of way or easements for which it has contractual control, including off-site (outside the project limits) support facilities on VDOT rights of way or easements that directly relate to the construction site.

The Contractor shall be responsible for securing VSMP Construction Permit coverage for all support facilities that are not located on VDOT rights of way or easements.

The required contents of a SWPPP for those land disturbance activities requiring coverage under the VSMP Construction Permit are found in Section II D of the General Permit section of the VSMP Regulations (4VAC50-60-1170). While a SWPPP is an important component of the VSMP Construction Permit, it is only one of the many requirements that must be addressed in order to be in full compliance with the conditions of the permit.

The Contractor and all other persons that oversee or perform activities covered by the VSMP Construction Permit shall be responsible for reading, understanding, and complying with all of the terms, conditions and requirements of the permit and the project's SWPPP including, but not limited to, the following:

1. Project Implementation Responsibilities

The Contractor shall be responsible for the installation, maintenance, inspection, and, on a daily basis, ensuring the functionality of all erosion and sediment control measures and all other stormwater and pollutant runoff control measures identified within or referenced within the SWPPP, plans, Specifications, permits, and other contract documents.

The Contractor shall be responsible for the temporary erosion and sediment control protection and permanent stabilization of all offsite borrow areas and soil disposal areas located outside of VDOT right of way or easement.

The Contractor shall take all reasonable steps to prevent or minimize any stormwater or non-stormwater discharge that will have a reasonable likelihood of adversely affecting human health or public and/or private properties.

2. Certification Requirements

In addition to satisfying the personnel certification requirements contained herein, the Contractor shall certify his activities by completing, signing, and submitting Form C-45 VDOT SWPPP Contractor and Subcontractor Certification Statement to the Engineer at least 7 days prior to commencing any project related land-disturbing activities, both within the project limits and any support facilities located on VDOT rights of way or easements.

3. SWPPP Requirements for Support Facilities

VDOT will secure VSMP Construction Permit coverage for support facilities located on VDOT rights of way or easements according to IIM-LD-242. The Contractor shall be responsible for securing separate VSMP Construction Permit coverage for support facilities that are not located on VDOT rights of way or easements.

Support facilities shall include, but not be limited to, borrow and disposal areas, construction and waste material storage areas, equipment and vehicle storage and fueling areas, storage areas for fertilizers or chemicals, sanitary waste facilities and any other areas that may generate a stormwater or non-stormwater discharge directly related to the construction site.

Support Facilities located on VDOT rights of way or easements:

- a. For those support facilities located within the project limits but not included in the construction plans for the project, the Contractor shall develop the erosion and sediment control plan(s) according to IIM-LD-11, the stormwater management plan(s) (where applicable) according to IIM-LD-195 and the stormwater pollution prevention plan(s) according to IIM-LD-246, and submit the plans to the Engineer for review and approval. Once approved, the Engineer will notify the Contractor in writing that the plans are accepted as a component of the Project's SWPPP and VSMP Construction Permit coverage (where applicable) and shall be subject to all conditions and requirements of the VSMP Construction Permit and all other contract documents. No land disturbing activities can occur in the support area(s) until written notice to proceed is provided by the Engineer.
- b. For support facilities located outside the project limits and not included in the construction plans for the project, the Contractor shall develop the erosion and sediment control plan(s) according to IIM-LD-11, the stormwater management plan(s) (where applicable) according to IIM-LD-195, the stormwater pollution prevention plan(s) according to IIM-LD-246 and all necessary documents for obtaining VSMP Construction permit coverage according to IIM-LD-242, and submit the plans and documents to the Engineer for review and approval. Once approved by the Engineer, VDOT will secure VSMP Construction

Permit coverage according to IIM-LD-242. After VDOT secures VSMP Construction Permit coverage for the support facility, the Engineer will notify the Contractor in writing. The support facility shall be subject to all conditions and requirements of the VSMP Construction Permit and all other contract documents. No land disturbing activities can occur in the support area(s) until written notice to proceed is provided by the Engineer.

4. Reporting Procedures

a. Inspection Requirements

The Contractor shall be responsible for conducting inspections in accordance with the requirements herein. The Contractor shall document such inspections by completion of Form C-107 , Construction Runoff Control Inspection Form , in strict accordance with the directions contained within the form.

b. Unauthorized Discharge Requirements

The Contractor shall not discharge into state waters sewage, industrial wastes, other wastes or any noxious or deleterious substances nor shall otherwise alter the physical, chemical, or biological properties of such waters that render such waters detrimental for or to domestic use, industrial consumption, recreational or other public uses.

(1) Notification of non-compliant discharges

The Contractor shall immediately notify the Engineer upon the discovery of or potential of any unauthorized, unusual, extraordinary, or non-compliant discharge from the land disturbing activity. Where immediate notification is not possible, such notification shall be not later than 24 hours after said discovery.

(2) Detailed report requirements for non-compliant discharges

The Contractor shall submit to the Engineer within 5 days of the discovery of any actual or potential non-compliant discharge a written report describing details of the discharge to include its volume, location, cause, and any apparent or potential effects on private and/or public properties and state waters or endangerment to public health, as well as steps being taken to eliminate the discharge. A completed Form C-107 (a) and (b) shall be included in such reports.

5. Changes, Deficiencies and Revisions

a. Changes and Deficiencies

The Contractor shall report to the Engineer when any planned physical alterations or additions are made to the land disturbing activity or deficiencies in the project plans or contract documents are discovered that could significantly change the nature or increase the quantity of the pollutants discharged from the land disturbing activity to surface waters.

b. Revisions to the SWPPP

Where site conditions, construction sequencing or scheduling necessitates revisions or modifications to the erosion and sediment control plan or any other component of the SWPPP for the land disturbing activity, such revisions or modifications shall be approved by the Engineer and shall be documented by the Contractor on a designated plan set (Record Set) according to IIM-LD-246.

Such plans shall be maintained on the project site or at a location convenient to the project site where no on site facilities are available and shall be available for review upon request during normal business working hours.

Section 107.21—Size and Weight Limitations of the Specifications is amended to add the following:

- (d) **Construction Loading of Structures** - In the construction, reconstruction, widening, or repair of bridge, culvert, retaining wall and other similar type structures including approaches, the Contractor shall consider construction loads during the planning and prosecution of the work. If the loading capacity of these type structure(s) is not shown in the contract documents, the Contractor is responsible for contacting the office of the appropriate district bridge engineer to obtain the loading capacity information. Construction loads include but are not limited to the weight of cranes, trucks, other heavy construction or material delivery equipment, as well as the delivery or storage of materials placed on or adjacent to the structure or parts thereof during the various stages (phases) of the work in accordance with the Contractor's proposed work plan. The Contractor shall consider the effect(s) of construction loads on the loading capacity of these type structure(s) in his sequencing of the work and operations, including phase construction. At the Engineer's request the Contractor shall be prepared to discuss or review his proposed operations with the Engineer with regard to construction loads to demonstrate he has taken such into consideration in the planning and execution of the work.

SECTION 108—PROSECUTION AND PROGRESS OF WORK

Section 108.01—Prosecution of Work of the Specifications is amended to replace the first paragraph with the following:

The Contractor shall begin work on the Contract within 10 calendar days after the date selected by the Contractor as his Notice to Proceed date or within 10 calendar days after the specific Notice to Proceed date indicated in the Contract, unless otherwise altered or amended by specific language in the Contract or as permitted by the provisions of Section 105.01 or Section 108.02 of the Specifications.

Section 108.02(b) Holidays of the Specifications is amended to include the following:

In addition to the Sunday or Holiday work limitations, mobile, short duration, short-term stationary, or intermediate-term stationary temporary traffic control zone (as defined in the *Virginia Work Area Protection Manual*) lane closures on mainline lanes, shoulders, or ramps shall not be performed during the following Holiday time periods without the written permission of the Engineer. Additionally, a long-term stationary temporary traffic control zone (as defined in the *Virginia Work Area Protection Manual*) shall not be initially put in place, adjusted, or removed during the following Holiday time periods without the written permission of the Engineer:

- **January 1:** From Noon on the preceding day until Noon on the following day, except as indicated below.
- **Easter:** As indicated below.
- **Memorial Day:** As indicated below.
- **July 4:** From Noon on the preceding day until Noon on the following day, except as indicated below.
- **Labor Day:** As indicated below.

- **Thanksgiving Day:** From Noon on the Wednesday preceding Thanksgiving Day until Noon on the Monday following Thanksgiving Day.
- **Christmas Day:** From Noon on the preceding day until Noon on the following day, except as indicated below.

If the Holiday occurs on a Friday or Saturday: From Noon on the preceding Thursday to Noon on the following Monday.

If the Holiday occurs on a Sunday or Monday: From Noon on the preceding Friday to Noon on the following Tuesday.

Section 108.04—Determination and Extension of Contract Time Limit of the Specifications is amended to replace the second paragraph with the following:

With a fixed date contract when contract execution is not within 60 calendar days after the opening of bids, or when the Contractor is unable to commence work because of any failure of the Department, or when the Contractor is delayed because of the fault of the Department, the Contractor will be given an extension of time based on the number of days delayed beyond the 60 calendar days. No time extension will be allowed for a delay in the date of contract execution when the delay is the fault of the Contractor.

Section 108.04(a) Fixed Date of the Specifications is amended to add the following after the first paragraph as currently written:

If the Contract identifies a contract-specific Notice to Proceed date and the Contract is not executed by that date, the Contractor will receive an extension of time equal to the number of days between the contract-specific Notice to Proceed date and the eventual date of contract execution. If the Notice to Proceed date is selected by the Contractor and after prior approval the Engineer directs the Contractor not to begin work on that date, the Contractor will receive an extension of time equal to the number of days between the Contractor's selected Notice to Proceed date and the eventual date the Engineer informs the Contractor that he may commence the work.

Section 108.07—Default of Contract of the Specifications is amended to replace condition (a) with the following:

- (a) fails to begin the work under the Contract within 10 calendar days after the Contractor's selected Notice to Proceed date, or within 10 calendar days after a contract specific Notice to Proceed date indicated in the Contract, except as otherwise permitted by specific contract language or the provisions of Section 105.01 or Section 108.02 of the Specifications.

SECTION 109—MEASUREMENT AND PAYMENT

Section 109.01(a)—Measurement by Weight is amended to replace the first paragraph and second paragraph including subparagraphs 1-4 with the following:

- (a) **Measurement by Weight:** Materials that are measured or proportioned by weight shall be weighted on accurate scales as specified in this Section. When material is paid for on a tonnage basis, personnel performing the weighing shall be certified by the Department and shall be bonded to the Commonwealth of Virginia in the amount of \$10,000 for the faithful observance and performance of the duties of the weighperson required herein. The bond shall be executed on a form having the exact wording as the Weighpersons Surety Bond Form furnished by the Department and shall be submitted to the Department prior to the furnishing of the tonnage material.

The Contractor shall have the weighperson perform the following:

1. Furnish a signed weigh ticket for each load that shows the date, load number, plant name, size and type of material, project number, schedule or purchase order number, and the weights specified herein.
2. Maintain sufficient documentation so that the accumulative tonnage and distribution of each lot of material, by contract, can be readily identified.
3. Submit by the end of the next working day a summary of the number of loads and total weights for each type of material by contract.

Section 109.01(a)—Measurement by Weight is also amended to delete the third paragraph.

Section 109.01(d)4 Asphalt is amended to replace the “formula...used in computing the volume of asphalt at temperatures other than 60 degrees F” with the following:

$$V' = V \times [1 - K(T - 60)]$$

Section 109.08(b)—Payment to Sub-Contractors of the Specifications is amended to replace the second paragraph with the following:

Payment to Sub-Contractors shall be in accordance with the provisions of §2.2-4354 of the *Highway Laws of Virginia*:

The Contractor shall take one of the following two actions within 7 days after receipt of payment from the Department for the subcontractor's portion of the work as shown on the monthly progress estimate:

1. Pay the subcontractor for the proportionate share of the total payment received from the agency attributable to the work performed by the subcontractor under that contract; or
2. Notify the Department and subcontractor, in writing, of his intention to withhold all or a part of the subcontractor's payment with the reason for nonpayment.

The Contractor shall be obligated to pay interest in the amount 1 (one) percent per month on all amounts owed by the Contractor to the subcontractor that remain unpaid after 7 days following receipt by the contractor of payment from the Department for work performed by the subcontractor, except amounts withheld as allowed in section 2. The Contractor shall include in each of its subcontracts a provision requiring each subcontractor to include or otherwise be subject to the same payment and interest requirements with respect to each lower tier subcontractor.

Section 109.09—Payment For Material On Hand of the Specifications is replaced with the following:

When requested in writing by the Contractor, payment allowances may be made for material secured for use on the project. Such material payments will be for only those actual quantities identified in the contract, approved work orders, or otherwise **authorized and documented by the Engineer** as required to complete the project and shall be in accordance with the following terms and conditions:

- (a) **Structural Steel or Reinforcing Steel:** An allowance of 100 percent of the cost to the Contractor for structural steel **or reinforcing steel** materials secured for fabrication not to exceed 60 percent of the contract price may be made when such material is delivered to the fabricator and has been adequately identified for exclusive use on the project. **The provisions of this section for steel reinforcement will only apply where the quantity of steel reinforcement is identified as a separate and distinct bid item for payment.** An

allowance of 100 percent of the cost to the Contractor for superstructure units and reinforcing steel, not to exceed 90 percent of the contract price, may be made when fabrication is complete. Prior to the granting of such allowances, the materials and fabricated units shall have been tested or certified and found acceptable to the Department and shall have been stored in accordance with the requirements specified herein. Allowances will be based on invoices, bills, or the estimated value as approved by the Engineer and will be subject to the retainage requirements of Section 109.08 of the Specifications. **For the purposes of this section fabrication is defined as any manufacturing process such as bending, forming, welding, cutting or coating with paint or anti-corrosive materials which alters, converts, or changes raw material for its use in the permanent finished work.**

- (b) **Other Materials:** For aggregate, pipe, guardrail, signs and sign assemblies, and other nonperishable material, an allowance of 100 percent of the cost to the Contractor for materials, not to exceed 90 percent of the contract price, may be made when such material is delivered **to the project** and stockpiled or stored in accordance with the requirements specified herein. Prior to the granting of such allowances, the material shall have been tested and found acceptable to the Department. Allowances will be based on invoices, bills, or the estimated value of the material as approved by the Engineer and will be subject to the retainage provisions of Section 109.08 of the Specifications.
- (c) **Excluded Items:** No allowance will be made for fuels, form lumber, falsework, temporary structures, or other work that will not become an integral part of the finished construction. **Additionally, no allowance will be made for perishable material such as cement, seed, plants, or fertilizer.**
- (d) **Storage:** Material for which payment allowance is requested shall be stored in an approved manner in areas where damage is not likely to occur. If any of the stored materials are lost or become damaged, the Contractor shall repair or replace them **at no additional cost to the Department. Repair or replacement of such material will not be considered the basis for any extension of contract time.** If payment allowance has been made prior to such damage or loss, the amount so allowed or a proportionate part thereof will be deducted from the next progress estimate payment and withheld until satisfactory repairs or replacement has been made.

When it is determined to be impractical to store materials within the limits of the project, the Engineer may approve storage on private property or, for structural units and reinforcing steel, on the manufacturer's or fabricator's yard. Requests for payment allowance for such **stored** material shall be accompanied by a release from the owner or tenant of such property or yard agreeing to permit the removal of the materials from the property without cost to the Commonwealth.

- (e) **Materials Inventory:** If the Contractor requests a payment allowance for properly stored material, he shall submit a certified and itemized inventory statement to the Engineer no earlier than five days and no later than two days prior to the progress estimate date. The statement shall be submitted on forms furnished by the Department and shall be accompanied by **supplier's or manufacturer's** invoices or other documents that will verify the material's cost. Following the initial submission, the Contractor shall submit to the Engineer a monthly-certified update of the itemized inventory statement within the same time frame. The updated inventory statement shall show additional materials received and stored with invoices or other documents and shall list materials removed from storage since the last certified inventory statement, with appropriate cost data reflecting the change in the inventory. If the Contractor fails to submit the monthly-certified update within the specified time frame, the Engineer will deduct the full amount of the previous statement from the progress estimate.

At the conclusion of the project, the cost of material remaining in storage for which payment allowance has been made will be deducted from the progress estimate.

— DIVISION II – MATERIALS —

**SPECIAL PROVISION COPIED NOTES (SPCNs), SPECIAL PROVISION (SPs) and
SUPPLEMENTAL SPECIFICATIONS (SSs)**

— **STANDARD 200 SERIES SPCNs, SPs, and SSs** —

VIRGINIA DEPARTMENT OF TRANSPORTATION
2007 ROAD AND BRIDGE SUPPLEMENTAL SPECIFICATIONS

SUPPLEMENTAL SECTION 207—SELECT MATERIAL

SECTION 207—SELECT MATERIAL of the Specifications is amended as follows:

Section 207.03—Job Mix Formula for Select Material, Type I is amended to replace the first paragraph with the following:

The Contractor shall submit or shall have the source of supply submit a job-mix formula for each mixture for the Engineer's approval through the "Producer Lab Analysis and Information Details" (PLAID) website <https://plaid.vdot.virginia.gov> prior to starting work. The formula shall establish a single percentage of aggregate passing each required sieve size denoted in Table II-6 and shall be in effect until a modification is approved by the Engineer. If unsatisfactory results or other changed conditions make it necessary, the Contractor shall prepare and submit a new formula for the Engineer's approval.

Section 207.05—Acceptance of Select Material, Type I is amended to replace the first and second paragraphs with the following:

Sampling and testing for determination of grading, moisture, and Atterberg limits shall be performed by the Contractor. The Contractor shall provide such test results within 48 hours of sampling to the Department through the "Producer Lab Analysis and Information Details" (PLAID) website <https://plaid.vdot.virginia.gov>. The Contractor shall maintain appropriate, current quality control charts. The Department will perform independent monitor tests. If there is a statistically significant difference between the two sets of results, an investigation will be made to determine the reason for the difference. If it is determined that the material does not conform to the requirements of the Contract, the material will be rejected or a payment adjustment will be made in accordance with the requirements of Section 207.07.

Determination of gradation and Atterberg limits will be based on a mean of the results of tests performed on four samples taken in a stratified random manner from each lot. Lots of 2000 tons or 4000 tons may be used at the discretion of the Engineer when warranted by annual plant shipping quantity and past performance. If visual examination reveals that the material is obviously contaminated or segregated, the material will be rejected without additional sampling or testing. If it is necessary to determine the gradation and Atterberg limits of the material in an individual location, one sample taken from the material in question will be tested and the results will be compared to the job-mix formula with the tolerances specified in Table II-7 and Table II-8 for one test. The results obtained will apply only to the material in question.

VIRGINIA DEPARTMENT OF TRANSPORTATION
2007 ROAD AND BRIDGE SUPPLEMENTAL SPECIFICATIONS

SUPPLEMENTAL SECTION 208—SUBBASE AND AGGREGATE BASE MATERIAL

SECTION 208—SUBBASE AND AGGREGATE BASE MATERIAL of the Specifications is amended as follows:

Section 208.04—Job Mix Formula is amended to replace the first paragraph with the following:

The Contractor shall submit, or shall have the source of supply submit a job-mix formula for each mixture for the Engineer's approval through the "Producer Lab Analysis and Information Detail" (PLAID) website <https://plaid.vdot.virginia.gov> prior to starting work. The formula shall be within the design range specified in Table II-9. If unsatisfactory results or other conditions make it necessary, the Contractor shall prepare and submit a new job-mix formula for approval.

Section 208.06—Acceptance is amended to replace the second and third paragraphs with the following:

Sampling and testing for determination of grading, moisture, and Atterberg limits shall be performed by the Contractor. The Contractor shall provide such test results within 48 hours of sampling to the Department through "the Producer Lab Analysis and Information Details" (PLAID) website <https://plaid.vdot.virginia.gov>. The Contractor shall maintain appropriate current quality control charts. The Department will perform independent monitor tests at a laboratory of its choice. If there is a statistically significant difference between the two sets of results, an investigation will be made to determine the reason for the difference. If it is determined that the material does not conform to the requirements of the Contract, the material will be rejected or a payment adjustment will be made in accordance with the requirements of Section 208.08.

Determination of gradation and Atterberg limits will be based on a mean of the results of tests performed on four samples taken in a stratified random manner from each lot. Lots of 2000 tons or 4000 tons may be used at the discretion of the Engineer when warranted by annual plant shipping quantity and past performance. Samples shall be obtained by methods approved by the Engineer. Any statistically acceptable method of randomization may be used to determine the time and location of the stratified random sample to be taken. The Department shall be advised of the method to be used prior to the beginning of production.

VIRGINIA DEPARTMENT OF TRANSPORTATION
2007 ROAD AND BRIDGE SUPPLEMENTAL SPECIFICATIONS

SUPPLEMENTAL SECTION 211—ASPHALT CONCRETE

SECTION 211—ASPHALT CONCRETE of the Specifications is amended as follows:

Section 211.01—Description is replaced with the following:

Asphalt concrete shall consist of a combination of mineral aggregate and asphalt material mixed mechanically in a plant specifically designed for such purpose.

An equivalent single-axle load (ESAL) will be established by the Engineer, and SUPERPAVE mix types may be specified as one of the types listed as follows:

Mix Type	Equivalent Single-Axle Load (ESAL) Range (millions)	Minimum Asphalt Performance Grade (PG) ²	Aggregate Nominal Maximum Size ¹
SM-9.0A	0 to 3	64-16	3/8 in
SM-9.0D	3 to 10	70-16	3/8 in
SM-9.0E	Above 10	76-22	3/8 in
SM-9.5A	0 to 3	64-16	3/8 in
SM-9.5D	3 to 10	70-16	3/8 in
SM-9.5E	Above 10	76-22	3/8 in
SM-12.5A	0 to 3	64-16	1/2 in
SM-12.5D	3 to 10	70-16	1/2 in
SM-12.5E	Above 10	76-22	1/2 in
IM-19.0A	Less than 10	64-16	3/4 in
IM-19.0D	10 to 20	70-16	3/4 in
IM-19.0E	20 and above	76-22	3/4 in
BM-25.0A	All ranges	64-16	1 in
BM-25.0D	Above 10	70-16	1 in

¹**Nominal Maximum Size** is defined as one sieve size larger than the first sieve to retain more than 10 percent aggregate.

²**Minimum Asphalt Performance Grade (PG)** is defined as the minimum binder performance grade for the job mixes as determined by AASHTO T170 or AASHTO M320.

Asphalt concrete shall conform to the requirements for the mix type designated.

At the Contractor's option, an approved Warm Mix Asphalt (WMA) additive or process may be used to produce the asphalt concrete (AC) mix type designated.

Section 211.02(h) antistripping additive is replaced with the following:

An antistripping additive shall be used in all asphalt mixes. It may be hydrated lime or an approved chemical additive from the Department's approved list found in the Materials Division's Manual of Instructions, or a combination of both. The approved chemical additive shall be added at a rate of not less than 0.30 percent by weight of the total asphalt content of the mixture.

The mixture shall produce a tensile strength ratio (TSR) not less than 0.80 for the design and production tests. The TSR shall be determined in accordance with AASHTO T283, including a

freeze-thaw cycle (4-inch specimens compacted with a Marshall Hammer or 3.5 by 6-inch specimens when compacted with a gyratory compactor); except that the 16-hour curing time requirement and the 72 to 96-hour storage period will be waived. Design tests shall use the same materials that are to be used in the production mix and shall be conducted in a laboratory approved by the Department.

When a chemical additive is used, it shall be added to the asphalt cement prior to introduction into the mix. Any chemical additive or particular concentration of chemical additive found to be harmful to the asphalt material or that changes the original asphalt binder performance grade (PG), shall not be used.

Section 211.02(j)1 is replaced with the following:

1. Asphalt surface, intermediate and base mixtures containing RAP should use the performance grade (PG) of asphalt cement as indicated in Table II-I4A, however, the choice of PG to use in the mix shall be the responsibility of the Contractor in order to meet the requirements of Section 211.01 of the Specifications.

Section 211.02—Materials is amended by adding the following:

- (k) **Warm Mix Asphalt (WMA)** additives or processes shall be approved by the Department prior to use. Approved materials and processes shall be obtained from the Department's approved list which is included in the Materials Division's Manual of Instructions.

TABLE II-12A AGGREGATE PROPERTIES is amended to add **Mix Type IM-19.0E** as follows:

**TABLE II-12A
Aggregate Properties**

Mix Type	Coarse Aggregate Properties			Fine Aggregate Properties	
	CAA		ASTM D4791 F & E "(5:1) % by weight	SE	FAA
	1 fractured face	2 fractured faces			
IM-19.0 E	95% min.	90% min.	10% max. ¹	45% min.	45% min.

TABLE II-13 ASPHALT CONCRETE MIXTURES: DESIGN RANGE is amended to add **Mix Type IM-19.0E** to IM-19.0 A,D as follows:

**TABLE II-13
Asphalt Concrete Mixtures: Design Range¹**

Mix Type	Percentage by Weight Passing Square Mesh Sieves									
	2 in	1 1/2 in	1 in	3/4 in	1/2 in	3/8 in	No. 4	No. 8	No. 30	No. 50 200
IM-19.0 A,D,E			100	90-100	90 max.	--	--	28-49		2-8

TABLE II-14 MIX DESIGN CRITERIA is replaced with the following:

Mix Type	VTM (%) Production (Note 1)	VFA (%) Design	VFA (%) Production (Note 2)	Min. VMA (%)	Fines/Asphalt Ratio (Note 3)	No. of Gyrations N Design
SM-9.0A ^{Notes 1,2,3}	2.0-5.0	75-80	70-85	16	0.6-1.3	65
SM-9.0D ^{Notes 1,2,3}	2.0-5.0	75-80	70-85	16	0.6-1.3	65
SM-9.0E ^{Notes 1,2,3}	2.0-5.0	75-80	70-85	16	0.6-1.3	65
SM-9.5A ^{Notes 1,2,3}	2.0-5.0	73-79	68-84	15	0.6-1.2	65
SM-9.5D ^{Notes 1,2,3}	2.0-5.0	73-79	68-84	15	0.6-1.2	65
SM-9.5E ^{Notes 1,2,3}	2.0-5.0	73-79	68-84	15	0.6-1.2	65
SM-12.5A ^{Notes 1,2,3}	2.0-5.0	70-78	65-83	14	0.6-1.2	65
SM-12.5D ^{Notes 1,2,3}	2.0-5.0	70-78	65-83	14	0.6-1.2	65
SM-12.5E ^{Notes 1,2,3}	2.0-5.0	70-78	65-83	14	0.6-1.2	65
IM-19.0A ^{Notes 1,2,3}	2.0-5.0	69-76	64-81	13	0.6-1.2	65
IM-19.0D ^{Notes 1,2,3}	2.0-5.0	69-76	64-81	13	0.6-1.2	65
IM-19.0E ^{Notes 1,2,3}	2.0-5.0	69-76	64-81	13	0.6-1.2	65
BM-25.0A ^{Notes 2,3,4}	1.0-4.0	67-87	67-92	12	0.6-1.3	65
BM-25.0D ^{Notes 2,3,4}	1.0-4.0	67-87	67-92	12	0.6-1.3	65

¹SM = Surface Mixture; IM = Intermediate Mixture; BM = Base Mixture.

Note 1: Asphalt content should be selected at 4.0 % Air Voids,

Note 2: During production of an approved job mix, the VFA shall be controlled within these limits.

Note 3: Fines-asphalt ratio is based on effective asphalt content.

Note 4: Base mix shall be designed at 2.5% air voids. BM-25.0 A shall have a minimum asphalt content of 4.4% unless otherwise approved by the Engineer. BM-25.0D shall have a minimum asphalt content of 4.6% unless otherwise approved by the Engineer.

Section 211.03—Job-Mix Formula is amended to replace the first paragraph with the following:

The Contractor shall submit a job-mix formula for each mixture for the Engineer's approval through the "Producer Lab Analysis and Information Details" (PLAID) website. Paper copies of the job mix formula along with supporting documentation shall also be submitted to the Department. The job-mix formula shall be within the design range specified. The job-mix formula shall establish a single percentage of aggregate passing each required sieve, a single percentage of asphalt material to be added to the aggregate, a temperature at which the mixture is to be produced, and a temperature at which the mixture is to be compacted for SUPERPAVE testing in accordance with the requirements of AASHTO R35. Each approved job-mix formula shall remain in effect, provided the results of tests performed on material currently being produced consistently comply with the requirements of the job-mix formula for grading, asphalt content, temperature, and SUPERPAVE compaction results and the requirements of Section 315 of the Specifications.

Section 211.03—Job-Mix Formula is amended by deleting the second paragraph of (a).

Section 211.03—Job-Mix Formula is amended to replace (c) with the following:

- (c) Three trial blends for gradation shall be run at one asphalt content.

Section 211.03—Job-Mix Formula is amended to replace (d)8 with the following:

8. For surface mixes, permeability test data shall be submitted in accordance with VTM 120 using either single point verification or the regression method for each surface mix having a different gradation. If the average of the permeability results from the single point verification method exceeds 150×10^{-5} cm/sec, or if the regression method predicts a permeability exceeding 150×10^{-5} cm/sec at 7.5% voids, the Contractor shall redesign the mixture to produce a permeability number less than 150×10^{-5} cm/sec.

Section 211.03—Job-Mix Formula is amended to replace (f) with the following:

- (f) A determination will be made that any asphalt concrete mixture being produced conforms to the job-mix formula approved by the Department. The Department and Contractor will test the mixture using samples removed from production. The following tests will be conducted to determine the properties listed:

Property	Test
Asphalt content	VTM-102, (VTM-36 when approved)
Gradation	AASHTO T-30
SUPERPAVE properties	AASHTO R35
Asphalt cement material	AASHTO T316 or T-201

For Warm Mix Asphalt (WMA), SUPERPAVE properties will be determined by the Department and Contractor based on the mix designation in Section 211.03(d)6 of the Specifications.

The Department will perform rut testing in accordance with the procedures detailed in VTM-110. If the results of the rut testing do not conform to the following requirements, the Engineer reserves the right to require adjustments to the job-mix formula:

Mix Designation	Maximum Rut Depth, mm
A	7.0
D	5.5
E, (S)	3.5

After calibration of the gyratory compactor is completed, adjustments to the job-mix formula may be required by the Engineer.

In the event the Department determines that the mixture being produced does not conform to the approved job-mix formula and volumetric properties specified in Table II-14 based on the Department's or Contractor's test results, the Contractor shall immediately make corrections to bring the mixture into conformance with the approved job-mix formula or cease paving with that mixture.

Subsequent paving operations using either a revised or other job-mix formula that has not been verified as described herein shall be limited to a test run of 100 to 300 tons of mixture if such material is to be placed in Department project work. No further paving for

the Department using that specific mixture shall occur until the acceptability of the mixture being produced has been verified using the 100 to 300 ton constraint.

TABLE II-14A
Recommended Performance Grade of Asphalt Cement

Mix Type	Percentage of Reclaimed Asphalt Pavement (RAP) in Mix		
	%RAP ≤ 25.0%	25.0% < %RAP ≤ 30%	25.0% < %RAP ≤ 35%
SM-4.75A, SM-9.0A, SM-9.5A, SM-12.5A	PG 64-22	PG 64-22	
SM-4.75D, SM-9.0D, SM-9.5D, SM-12.5D	PG 70-22	PG 64-22	
IM-19.0A	PG 64-22	PG 64-22	
IM-19.0D	PG 70-22	PG 64-22	
BM-25.0A	PG 64-22		PG 64-22
BM-25.0D	PG 70-22		PG 64-22

Based on rut testing performed by the Department and/or field performance of the job mix, the Engineer reserves the right to require adjustments to the job-mix formula.

Section 211.04—Asphalt Concrete Mixtures is amended by replacing (b) with the following:

- (b) **Types IM-19.0A, IM-19.0D, and IM-19.0E asphalt concrete** shall consist of crushed stone, crushed slag, or crushed gravel and fine aggregate, slag or stone screenings, or a combination thereof combined with asphalt cement.

NOTE: At the discretion of the Engineer, an intermediate mix may be designated as either SM-19.0A, SM-19.0D or SM-19.0E. When designated as such, no more than 5 percent of the aggregate retained on the No. 4 sieve may be polish susceptible. All material passing the No. 4 sieve may be polish susceptible.

Section 211.04—Asphalt Concrete Mixtures is amended to replace (e) with the following:

- (e) **Type SM-9.5, SM-12.5, IM-19.0 and BM-25.0 asphalt concrete** may be designated E (polymer modified), or stabilized (S). Asphalt concrete mixtures with the E designation may not be stabilized.
1. **Type E asphalt mixtures** shall consist of mixes incorporating a neat asphalt material with polymer modification complying with the requirements of PG 76-22 and have a rolling thin film oven test residue elastic recovery at 77 degrees F of a minimum of 70 percent when tested in accordance with ASTM D 6084 procedure A. E designated mixtures shall not contain more than 15 percent reclaimed asphalt pavement (RAP) material.
 2. **Type (S) asphalt mixtures** shall consist of mixes incorporating a stabilizing additive from the Department's approved list found in the Materials Division's Manual of Instructions. These mixes shall be designated with an (S) following the standard mix designation. The minimum required additive shall be as specified on the Department's approved list found in the Materials Division's Manual of Instructions.

3. **Type L asphalt mixtures** will be allowed to contain a 100 percent polishing coarse and fine aggregate. These mixes shall be designated with a L following the standard mix designation.

Section 211.05—Testing is amended to replace the second paragraph with the following:

The Contractor shall have a Department-certified Asphalt Mix Design Technician for designing and adjusting mixes as necessary. The Asphalt Mix Design Technician or Asphalt Plant Level II Technician may perform testing of asphalt mixes. The Asphalt Mix Design Technician shall be responsible for reviewing and approving the results of all testing. The Asphalt Mix Design Technician shall be available and have direct communication with the plant for making necessary adjustments in the asphalt concrete mixes at the mixing plant. The Asphalt Mix Design Technician and Asphalt Plant Level II Technician shall each be capable of conducting any tests necessary to put the plant into operation; however, the Asphalt Mix Design Technician shall be responsible for producing a mixture that complies with the requirements of these Specifications. The Department will award certification.

Section 211.05—Testing is amended to delete the last sentence of the last paragraph.

Section 211.06—Tests is replaced with the following:

The Department may sample materials entering into the composition of the asphalt concrete, the mixture, or the completed pavement. The Contractor shall cooperate with the Engineer in obtaining these samples. When samples are obtained from the pavement, the resulting voids shall be filled and refinished by the Contractor without additional compensation.

Abson recovery samples shall be PG graded according to the requirements of AASHTO M 320-05. Samples meeting the required grades specified in Section 211.01 of the Specifications shall be acceptable.

When the Department performs PG grading on the asphalt in a Contractor's liquid asphalt storage tank, the Engineer will notify the asphalt concrete producer and binder supplier if tests indicate that the binder properties of the asphalt material differ from those of the approved job-mix. The asphalt concrete producer and binder supplier shall determine corrective action with the approval of the Engineer.

Section 211.08—Acceptance is amended to replace the first paragraph with the following:

Acceptance will be made under the Department's quality assurance program, which includes the testing of production samples by the Contractor and of monitor samples by the Department. Sampling and testing for the determination of grading, asphalt cement content, and temperature shall be performed by the Contractor, and the Department will perform independent monitor checks at a laboratory of its choosing. The Contractor shall input such test results within 24 hours of sampling to the Department through the "Producer Lab Analysis and Information Details" (PLAID) website <https://plaid.vdot.virginia.gov>, unless otherwise approved by the Materials Engineer. Where the Contractor's test results indicate that the mixture conforms to the gradation, asphalt cement content, and mix temperature requirements of the Specifications, the mixture will be acceptable for these properties; however, nothing herein shall be construed as waiving the requirements of Section 106.06, Section 200.02, Section 200.03, and Section 315 of the Specifications or relieving the Contractor of the obligation to furnish and install a finished functional product that conforms to the requirements of the Contract. In the event a statistical comparative analysis of the Contractor's test results and the Department's monitor tests indicate a statistically significant difference in the results and either of the results indicates that the material does not conform to the grading and asphalt cement content requirements of the Specifications, an investigation will be made to determine the reason for the difference. In the event it is determined from the investigation that the material does not conform to the

requirements of the Contract, price adjustments will be made in accordance with the requirements of Section 211.09 of the Specifications.

Section 211.08—Acceptance is amended to replace the second paragraph with the following:

Acceptance for gradation and asphalt cement content will be based on the mean of results of eight tests performed on samples taken in a stratified random manner from each 4,000-ton lot (8,000-ton lots may be used when the normal daily production of the source from which the material is being obtained is in excess of 4,000 tons). Unless otherwise approved by the Engineer, samples shall be obtained from the approximate center of the truckload of material. Any statistically acceptable method of randomization may be used to determine when to take the stratified random sample; however, the Department shall be advised of the method to be used prior to the beginning of production.

Section 211.08—Acceptance is amended to replace the third sentence of the fourth paragraph with the following:

The maximum temperature as recommended by the supplier shall not be exceeded for a mix designated E or (S).

Table II-15 PROCESS TOLERANCE is replaced with the following:

TABLE II-15
Process Tolerance

Tolerance on Each Laboratory Sieve and Asphalt Content: Percent Plus and Minus												
No. Test s	Top Size 1	1 ½"	1"	¾"	½"	3/8"	No. 4	No. 8	No. 30	No. 50	No. 200	A.C.
1	0.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	6.0	5.0	2.0	.60
2	0.0	5.7	5.7	5.7	5.7	5.7	5.7	5.7	4.3	3.6	1.4	0.43
3	0.0	4.4	4.4	4.4	4.4	4.4	4.4	4.4	3.3	2.8	1.1	0.33
4	0.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	3.0	2.5	1.0	0.30
5	0.0	3.6	3.6	3.6	3.6	3.6	3.6	3.6	2.7	2.2	0.9	0.27
6	0.0	3.3	3.3	3.3	3.3	3.3	3.3	3.3	2.4	2.0	0.8	0.24
7	0.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	2.3	1.9	0.8	0.23
8	0.0	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.1	1.8	0.7	0.21
12	0.0	2.3	2.3	2.3	2.3	2.3	2.3	2.3	1.7	1.4	0.6	0.17

¹Defined as the sieve that has 100% passing as defined in Table II-13.

Section 211.09 is amended to replace the last three paragraphs with the following:

The unit bid price will be reduced by 0.5 percent for each adjustment point applied for standard deviation.

Section 211.10—Referee System is amended to replace (a) and (b) with the following:

- (a) In the event the test results obtained from one of the eight samples taken to evaluate a particular lot appear to be questionable, the Contractor may request in writing that the results of the questionable sample be disregarded, whereupon the Contractor shall have either an AASHTO-accredited lab or Department lab perform tests on five additional samples taken from randomly selected locations in the roadway where the lot was placed.

In the event the Engineer determines that one of the 8 test results appears to be questionable, the Department will perform tests on five additional samples taken from the randomly selected locations in the roadway where the lot was placed. The test results of the seven original, i.e. unquestioned, samples will be averaged with the test results of the five road samples, and the mean of the test values obtained for the twelve samples will be compared to the requirements for the mean of twelve tests as specified in Table II-15.

- (b) In the event the Contractor questions the mean of the eight original test results obtained for a particular lot, the Contractor may request in writing approval to have either an AASHTO-accredited lab or Department lab perform additional testing of that lot.

In the event the Engineer determines that the mean of the eight original test results are questionable, the Department will perform additional testing of that lot. The test results of the eight samples will be averaged with the test results of the four additional samples taken from randomly selected locations in the roadway where the lot was placed, and the mean of the test values obtained from the twelve samples will be compared to the requirements for the mean of twelve tests as specified in Table II-15.

If the Contractor requests additional tests, as described in (a) or (b) herein, the Contractor shall sample the material and have either an AASHTO-accredited lab or Department lab test the material in accordance with Department-approved procedures. The Engineer reserves the right to observe the sampling and testing.

In the event the mean of the test values obtained for the twelve samples conforms to the requirements for the mean of twelve tests, the material will be considered acceptable. In the event that the mean of the test values obtained for the twelve samples does not conform to the requirements for the mean result of twelve tests, the lot will be adjusted in accordance with the adjustment rate specified in Section 211.09 of the Specifications.

Samples of the size shown herein shall be saw cut by the Contractor for testing without the use of liquids:

Application Rate	Minimum Sample Size
125 lb/yd ²	8 by 8 in
150 lb/yd ²	7 by 7 in
200 lb/yd ²	6 by 6 in
300 lb/yd ²	5 by 5 in

Section 211.12 (a) – Certification for Plant Operation and Sampling is replaced with the following:

- (a) **Certification for Plant Operation and Sampling:** A Certified Asphalt Plant Level I Technician or a Certified Asphalt Plant Level II Technician shall sample material at the plant.

Section 211.15—Initial Production is replaced with the following:

- (a) **Warm Mix Asphalt (WMA):** At the start of production, the Contractor shall place no more than 500 tons or up to one day's production as directed by the Engineer at an approved site, which may be the project site, so the Engineer can examine the process control of the mixing plant, the Contractor's placement procedures, surface appearance of the mix, compaction patterns of the Contractor's roller(s), and correlation of the nuclear density device.
- (b) **Hot Mix Asphalt (HMA):** At the start of production of a mix not previously used on a state roadway, the Contractor shall place 100 to 300 tons or up to one day's production

as directed by the Engineer at an approved site, which may be the project site, so the Engineer can examine the process control of the mixing plant, the Contractor's placement procedures, surface appearance of the mix, compaction patterns of the Contractor's roller(s), and correlation of the nuclear density device.

The material shall be placed at the specified application rate and will be paid for at the contract unit price for the specified mix type. The Engineer will determine the disposition of material that was not successfully produced and/or placed due to negligence in planning, production, or placement by the Contractor.

VIRGINIA DEPARTMENT OF TRANSPORTATION
2007 ROAD AND BRIDGE SUPPLEMENTAL SPECIFICATIONS

SUPPLEMENTAL SECTION 214—HYDRAULIC CEMENT

SECTION 214—HYDRAULIC CEMENT of the Specifications is amended as follows:

Section 214.02(b) Portland cements is amended by replacing 1. with the following:

1. The SO₃ content as specified in AASHTO M85 will be permitted, provided supporting data specified in AASHTO M85 are submitted to the Department for review and acceptance prior to use of the material.

Section 214.02(b) Portland cements is amended by deleting 3., 4., and 5.

Section 214.02—Detail Requirements is amended by adding the following:

- (c) **Expansive hydraulic cement** shall conform to the requirements of ASTM C 845 Type K.

VIRGINIA DEPARTMENT OF TRANSPORTATION
2007 ROAD AND BRIDGE SUPPLEMENTAL SPECIFICATIONS

SUPPLEMENTAL SECTION 215—HYDRAULIC CEMENT CONCRETE ADMIXTURES

SECTION 215—HYDRAULIC CEMENT CONCRETE ADMIXTURES of the Specifications is amended as follows:

Section 215.02(g) Fly ash is replaced with the following:

- (g) **Pozzolan** shall conform to Section 241 of the Specifications.

Section 215.02—Materials is amended by adding the following:

- (k) **Metakaolin** shall conform to the requirements of AASHTO M321

VIRGINIA DEPARTMENT OF TRANSPORTATION
2007 ROAD AND BRIDGE SUPPLEMENTAL SPECIFICATIONS

SUPPLEMENTAL SECTION 217—HYDRAULIC CEMENT CONCRETE

SECTION 217—HYDRAULIC CEMENT CONCRETE of the Specifications is amended as follows:

Section 217.02(a) Cementitious Materials is replaced with the following:

Cementitious materials shall be a blend of mineral admixtures and Portland cement or a blended cement. In overlay concretes, expansive hydraulic cement is permitted in lieu of Portland cement. Portland cement (Types I, II, III) blended cements (Type IP, Type IS) or expansive cement (Type K) shall comply with Section 214 of the Specifications. Flyash, ground granulated iron blast-furnace slag (GGBFS), silica fume or metakaolin shall conform to Section 215 of the Specifications. As a portion of the cementitious material, Table 1 lists the minimum percents of specific pozzolans required by mass of the cementitious material depending on the alkali content of the cement. Any other mineral admixture or any other amount or combination of mineral admixtures may be used if approved by the Engineer. As a portion of the cementitious material, the fly ash content shall not exceed 30 percent for Class F, the ground granulated blast-furnace slag content shall not exceed 50 percent and the silica fume content shall not exceed 10 percent unless approved by the Engineer. Class C Flyash or other pozzolans may be used provided the contractor demonstrates that the percent usage of Class C Flyash or other pozzolans have a maximum expansion of 0.15% according to ASTM C227 at 56 days using borosilicate glass as aggregate. Blended cements require no further pozzolan additions to meet minimum pozzolan content to compensate for the alkali-silica reaction.

Up to 7 percent silica fume may be added to all combinations of cementitious materials to reduce early permeability without approval by the Engineer. Other silica fume additions must be approved by the Engineer.

Table 1 – Minimum percent pozzolan required by mass of cementitious material as a portion of the total cementitious materials and are based upon the alkali content of the cement.

	Total Alkalies of Cement is less than or equal to 0.75%	Total Alkalies of Cement is greater than 0.75% and less than or equal to 1.0%
Class F Flyash	20%	25%
GGBF Slag	40%	50%
Silica Fume	7%	10%
Metakaolin	7%	10%

TABLE II–17 Requirements for Hydraulic Cement Concrete is replaced with the following:

TABLE II-17
Requirements for Hydraulic Cement Concrete

Class of Concrete	Design Min. Laboratory Compressive Strength at 28 Days (f'c) (psi)	Aggregate Size No. ⁶	Design Max. Laboratory Permeability at 28 Days (Coulombs) ⁵	Design Max. Laboratory Permeability at 28 days - Over tidal water (Coulombs) ⁵	Nominal Max. Aggregate Size (in)	Min. Grade Aggregate	Min. Cementitious Content (lb./cu yd)	Max. Water /Cementitious Mat. (lb. Water/lb. Cement)	Consistency (in of slump)	Air Content (percent) ¹
A5 Prestressed and other special designs ²	5,000 or as specified on the plans	57 or 68	1,500	1,500	1	A	635	0.40	0-4	4 1/2 ± 1 1/2
A4 General	4,000	56 or 57	2,000	2,500	1	A	635	0.45	2-4	6 1/2 ± 1 1/2
A4 Post & rails	4,000	7,8 or 78	2,000	2,500	0.5	A	635	0.45	2-5	7 ± 2
A3 General	3,000	56 or 57	2,000	3,500	1	A	588	0.49	1-5	6 ± 2
A3a Paving	3,000	56 or 57	3,500	3,500	1	A	564	0.49	0-3	6 ± 2
A3b Paving	3,000	357	3,500	3,500	2	A	N/A	0.49	0-3	6 ± 2
B2 Massive or lightly Reinforced	2,200	57	N.A.	N.A.	1	B	494	0.58	0-4	4 ± 2
C1 Massive Unreinforced	1,500	57	N.A.	N.A.	1	B	423	0.71	0-3	4 ± 2
T3 Tremie seal	3,000	56 or 57	N.A.	N.A.	1	A	635	0.49	3-6	4 ± 2
Latex hydraulic cement concrete overlay ³	3,500	7,8 or 78	1,500	1,500	0.5	A	658	0.40	4-6	5 ± 2
Silica fume, silica fume /Class F Fly Ash or silica fume/slag concrete overlay ⁴	5000	7,8 or 78	1,500	1,500	0.5	A	658	0.40	4-7	6 ± 2
Class F Fly Ash or slag overlay	4000	7,8 or 78	1,500	1,500	0.5	A	658	0.40	4-7	6 ± 2

(See next page for notes on TABLE II-17).

(See next page for notes on TABLE II-17).

----- (TABLE II-17 Notes) -----

- ¹ When a high-range water reducer is used, the upper limit for entrained air may be increased by 1% and the slump shall not exceed 7 inches.
- ² When Class A5 concrete is used as the finishing bridge deck riding surface, or when it is to be covered with asphalt concrete with or without waterproofing, the air content shall be $5 \frac{1}{2} \pm 1 \frac{1}{2}$ percent.
- ³ The latex modifier content shall be 3.5 gallons per bag of cement. Slump shall be measured approximately 4.5 minutes after discharge from the mixer.
- ⁴ Silica fume with a minimum of 7% by weight of cementitious material; silica fume with a range of 2.5-5 % shall be combined with Class F Fly Ash in range of 15-20% and minimum cement of 77.5% by weight of cementitious material; silica fume with a range of 2.5-5% shall be combined with Ground Granulated Blast Furnace Slag in the range of 30-35% and a minimum cement of 67.5% by weight of cementitious material.
- ⁵ The permeability testing does not apply to small bridges identified on the bridge plans and to concrete structures and incidental concrete as described in Sections 219, 232, 302, 415, 502, 504, 506 and 519. Curing and testing of test cylinders for permeability will be in accordance with VTM 112.
- ⁶ The contractor may use different aggregate sizes or a combination of sizes to increase the coarse aggregate content of the concrete as approved by the Engineer. The maximum size of the coarse aggregate shall not exceed 2.5 inches.

Note: With the approval of the Engineer, the Contractor may substitute a higher class of concrete for that specified at the Contractor's expense.

Section 217.02(b) Formulated latex modifier is amended by adding the following:

For latex-modified concrete, Type I, Type II, Type III or Type K, cement shall be used without mineral admixtures.

Section 217.04(a)4. Admixtures is replaced with the following:

4. **Admixtures** shall be dispensed and used according to the manufacturer's recommendations. They shall be added within a limit of accuracy of 3 percent, by means of an approved, graduated, transparent, measuring device before they are introduced into the mixer. If more than one admixture is to be used, they shall be released in sequence rather than in the same instant. Once established, the sequence of dispensing admixtures shall not be altered. However, when the amount of admixture required to give the specified results deviates appreciably from the manufacturer's recommended dosage, use of the material shall be discontinued.

Section 217.05—Equipment is amended to replace the first paragraph with the following:

Equipment and tools necessary for handling materials and performing all parts of the work will be approved by the Engineer and must be in accordance with one of the following procedures:

1. having a current National Ready Mix Concrete Association Plant and Truck Certification, or
2. having a Department approved self-certification program in-place prior to the production of concrete for the Department.

Failure to comply with one or the other of these procedures will result in the concrete production being unapproved and work will not be allowed to proceed.

Section 217.05(a) Batching Equipment is amended to replace the second paragraph with the following:

Scales used for weighing aggregates and cement shall be approved and sealed in accordance with the requirements of Section 109 of the Specifications.

Section 217.05—Equipment is amended to add the following:

(d) **High Performance Volumetric Mixers (HPVMs):** The Contractor may produce the specified class of hydraulic cement concrete in Table II-17 in accordance with Section 217.02(a) of the Specifications provided that the manufacturer's equipment meets the tolerance requirements of Section 217.04(a) of the Specifications and has a stamped plate from the Volumetric Mixers Manufacturers Bureau stating that the equipment conforms to the requirements in ASTM C685.

The hydraulic cement concrete shall be mixed at the point of delivery by a combination of materials transport and mixer unit conforming to the following:

1. The unit shall be equipped with calibrated proportioning devices for each ingredient added to the concrete mix. The unit shall be equipped with a working recording meter that is visible at all times and furnishes a ticket printout with the calibrated measurement of the mix being produced. If at anytime the mixer fails to discharge a uniform mix, production of concrete shall halt until any problems are corrected.
2. Each unit shall have a metal plate(s) attached in a prominent place by the manufacturer on which the following are plainly marked: the gross volume of the transportation unit in terms of mixed concrete, the discharge speed and the mass calibrated constant of the machine in terms of volume.
3. HPVMs shall be calibrated by a Department approved testing agency in accordance with the manufacturer's recommendations at an interval of every 6 months or a maximum production of 2500 cubic yards, whichever occurs first prior to use on the project. The yield shall be maintained within a tolerance of ± 1 percent and verified using a minimum 2 cubic feet container every 500 cubic yards or a minimum once per week.
4. The three cubic feet initially discharged from the truck shall be discarded and not used for concrete placement. Acceptance of the specified class of concrete shall comply with Section 217.08 of the Specifications except that the sample secured for acceptance testing will be taken after four cubic feet is discharged from the delivery vehicle. During discharge, the consistency as determined by ASTM C143 on representative samples taken from the mixer discharge at random intervals shall not vary more than 1 inch. Acceptance tests shall be performed on each load. If test data demonstrates that consistency of concrete properties are being achieved, the Engineer may reduce testing requirements.
5. The HPVM shall be operated by a person who is a certified operator by the HPVM manufacturer. Any equipment adjustments made during the on-site production of concrete shall be done under the direct on-site supervision of the producer's VDOT Concrete Plant and Field Certified Technician.

Each load of HPVM produced concrete shall be accompanied by a Form TL-28 signed by the producer's VDOT Certified Concrete Plant Technician or a designated company representative working under the direct on-site supervision of the producer's VDOT Concrete Plant and Field Certified Technician. The form shall be delivered to the Inspector at the site

of the work. Loads that do not carry such information or do not arrive in satisfactory condition shall not be used.

Section 217.07—Proportioning Concrete Mixtures is amended to replace the first paragraph with the following:

The Contractor is responsible for having a Certified Concrete Plant Technician available during batching operations, and a Certified Concrete Field Technician shall be present during placing operations.

Section 217.07—Proportioning Concrete Mixtures is amended to delete the third paragraph beginning with “A Certified Concrete Batchers”.

Section 217.07—Proportioning Concrete Mixtures of the Specifications is amended to replace the eleventh paragraph with the following:

Except for latex hydraulic cement concrete, concrete mixtures shall be developed and/or verified by any one of the following three options listed below.

The mix design(s) as determined by the respective option shall be valid provided there is no change in sources of aggregate, chemical admixtures, mineral admixtures or hydraulic cement. All concrete mixtures shall contain the minimum amount of mineral admixtures or combination thereof expressed as a percent of the total cementitious materials in accordance with Section 217.02(a). All quantities of materials shall be weighed in accordance with tolerances specified in Section 217.04. Neither the quantities of coarse or fine aggregates used in concrete production shall deviate by more than $\pm 5\%$ by weight from the batch weights of the approved mix design.

When low permeability concrete is specified, two 4 X 8 inch specimens shall be molded from concrete representing the proposed mix design and tested in accordance with VTM 112 to validate conformance. For trial batches, the tested permeability value shall be considered satisfactory provided it is 500 coulombs less than the specified maximum value for the class of concrete specified.

Option 1 - Prescriptive Method:

Mix proportions for normal, heavy weight, and lightweight concrete shall be established by the methods described in ACI 211, on an absolute volume basis, for the respective aggregate size and meeting all the requirements of Table II-17 for the class of concrete indicated. Aggregate properties obtained from the aggregate producer shall be used for design purposes.

Once the proposed mix design has been established, the contractor or their concrete supplier shall produce one 3-cubic yard production verification batch using the same type of equipment intended for use in supplying concrete to the Department. The proposed mix design will be considered acceptable provided that the plastic properties of the concrete are within the Department's specification limits for the given class of concrete. Strength tests of the verification batch must equal or exceed $f'c$ for the intended class of concrete.

Option 2 - Trial Batch Mix Design Method:

The minimum cementitious content requirement in Table II-17 shall be waived provided that the maximum water-cementitious ratio requirement of Table II-17 is met for the respective class of concrete. The required grading for fine and coarse aggregate shall be waived provided the coarse aggregate meets the nominal maximum size as required in Table II-17 for the respective class of concrete.

The Contractor or their concrete supplier shall prepare a minimum of 3 trial concrete batches with differing cementitious materials contents over a range anticipated to encompass the design strength, f'_c , plus overdesign, and water-cementitious ratios encompassing the range permitted for the classes of concrete being evaluated. Trial batches may be produced in either;

Option 2A: Small scale laboratory batches, or

Option 2B: Truck batches with a minimum batch volume of 3 cubic yards each.

The plastic properties of the trial concrete batches shall meet the requirements for consistency and air content in Table II-17 and meet the additional requirements listed below:

- The concrete temperature of the trial batches, as batched and sampled, shall be a minimum of 68 degrees F.
- Air content of the trial batches shall within a range of -1.0 to + 1.5 percentage points of the median design air content for the classes of concrete being evaluated.
- Slump of the trial batches shall be within ± 1 inch of the maximum slump permitted for the class of concrete.

Three 4 X 8 inch test specimens shall be molded from each batch, cured in accordance with ASTM C 31 for acceptance specimens, and then compression tested at an age of 28 days. The strength results of these tests shall be plotted on a graph to establish the relationship between the water-cementitious ratio and the compressive strength. Alternately, the relationship can be established between the cementitious content and the compressive strength. The design water-cementitious ratio, or design cementitious content, can then be derived from the graph to satisfy the required design strength plus an appropriate overdesign to be designated as f'_{cr} . The required cementitious materials content determined from these tests can be interpolated from the established graph. If desired, the design water-cementitious ratio or cementitious content can be determined from a polynomial regression analysis of the plotted strength data.

Test results from prior trial concrete batches are acceptable for use provided that they represent the same material sources proposed for the Department work, meet the requirements for trial concrete batches as stated above and are less than 18 months old.

The required cementitious content to satisfy the strength requirement for the respective class of concrete shall be determined in accordance with either of the two following procedures:

1. When the concrete production facility has sufficient data to establish a production standard deviation (s), as described in **Documentation of Previous Field Experience or Production Standard Deviation (s)**. The cementitious content required to meet the design strength requirement, f'_{cr} , then the f'_{cr} shall be based upon the following equation:

$$f'_{cr} = f'_c + 3s$$

2. When the concrete production facility does not have a production standard deviation established the cementitious content required to meet the design strength requirement, f'_{cr} , then the f'_{cr} shall be based upon the following equation :

$$f'_{cr} = f'_c + 1700 \text{ psi.}$$

Once the proposed mix design has been established, the contractor or their concrete supplier shall produce one 3-cubic yard production verification batch using the same type of

equipment intended for use in supplying concrete to the Department. The proposed mix design will be considered acceptable provided that the plastic properties of the concrete are within the Department's specification limits for the given class of concrete. Strength tests of the verification batch must equal or exceed f_c for the intended class of concrete. The requirement for a production verification batch shall be waived when the trial batching is performed by Option 2B -Truck batches.

Option 3 - Documented Field Experience Method:

The minimum cementitious content requirement in Table II-17 shall be waived provided that the maximum water-cementitious ratio requirement of Table II-17 is met for the respective class of concrete. The required grading for fine and coarse aggregate shall be waived provided the coarse aggregate meets the nominal maximum size as required in Table II-17 for the respective class of concrete.

An existing concrete mixture shall be considered acceptable for use provided that the contractor or their concrete supplier has a satisfactory test record of previous field experience as described in:

Documentation of Previous Field Experience or Production Standard Deviation (s), and that the proposed concrete mixture meets the following requirements:

1. The water cementitious ratio of the proposed concrete mixture is less than or equal to the maximum water cementitious ratio specified for the respective class of concrete.
2. The documented average strength, f_{cr} , equals or exceeds the design compressive strength f_c for the respective class of concrete in accordance with the following equation: $f_{cr} = f_c + 3s$
3. The proposed concrete mixture contains the same aggregate sources, supplementary cementitious materials type, and admixture type as those used to establish the previous field experience test record.
4. The consistency (slump) and air content are within the specification limits for the respective class of concrete.

Documentation of Previous Field Experience or Production Standard Deviation (s)

An acceptable test record to document previous field experience and/or to establish a production facility standard deviation shall represent a minimum of 30 consecutive compressive strength tests results, encompass a production period of at least 45 days and test data not more than 18 months old. A test record of less than 30 tests, but not less than 15 tests, shall be permitted provided a modification factor is applied to the production facility sample standard deviation as shown below:

Multiply Standard Deviation by Modification Factor	
Number of Test	Modification Factor
15	1.16
20	1.08
25	1.03
30	1.00

The test record does not necessarily have to be based on Department projects provided that documentation of the source(s) of concrete strength test results accompanies the submittal.

Section 217.08—Acceptance is replaced with the following:

- (a) **Air Consistency Tests:** Air and consistency tests will be performed by the Department prior to discharge of concrete into the forms to ensure that specification requirements are consistently being complied with for each class of concrete. The sample secured for the tests shall be taken after at least two cubic feet of concrete has been discharged from the delivery vehicle. The two cubic feet discharged is not to be used as part of the test sample. Any deviation from sampling and testing procedures must be approved by the Engineer. The Contractor shall provide a receptacle conforming to the requirements of ASTM C31, Section 5.9, for the Department's use in obtaining the sample. If either determination yields a result that is outside of the allowable range for air content or consistence, the following procedure will be used:
1. The Engineer will immediately perform a recheck determination. If the results confirm the original test results, the load will be rejected.
 2. The Contractor's representative will be immediately informed of the test results.
 3. The Contractor's representative shall notify the producer of the test results through a pre-established means of communication.

The Engineer may perform any additional tests deemed necessary and reject all remaining material that fails the tests.

Entrained air content will be determined in accordance with the requirements of ASTM C231 or ASTM C173. Acceptance or rejection will be based on the results obtained from these tests.

In general, a mixture that contains the minimum amount of water consistent with the required workability shall be used. Consistency will be determined in accordance with the requirements of ASTM C143. Adding cement to loads previously rejected for excessive water content or consistency will not be permitted.

- (b) **Strength Tests:** The 28-day compressive strengths (f'_c) specified in Table II-17 are the strengths used in the design calculations. The Engineer will verify design strengths by tests made during the progress of the work in accordance with the requirements of ASTM C31 (Standard Practice for Making and Curing Concrete Test Specimens in the Field) and ASTM C39 (Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens) with the exception that the fresh concrete sample used for testing is to be secured after at least two cubic feet has been discharged from the delivery vehicle. The two cubic feet discharged is not to be used as part of the test sample. Any deviation from sampling and testing procedures must be pre-approved by the Engineer. The use of ASTM C42 (Standard Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete) will be at the Engineer's discretion. If the 28-day design compressive strength (f'_c) test results do not conform to the strength requirements specified in Table II-17, immediate steps shall be taken to adjust the mixture design. In addition, the Engineer may require removal of or corrective measures be applied to any concrete that does not meet the requirements of Table II-17. If the concrete cylinder strength, f'_{cyl} , is less than the specified compressive strength found in Table II-17, the criteria in Table II-17A shall apply:

Table II – 17A Price Reduction or Action Taken due to f'_{cyl} not meeting the specification value f'_c listed in Table II-17

Condition	Concrete is a Pay Item	Concrete is <u>Not</u> a Pay Item
f'_{cyl} is greater than or equal to 98% f'_c	A	A
f'_{cyl} is greater than or equal to 90% f'_c and less than 98% f'_c	B	C
f'_{cyl} is less than 90% f'_c	D	D
f'_{cyl} is not available due to the Contractor's inappropriate handling and storage of specimens in accordance with ASTM C31	D	D

f'_c is the 28-day design compressive strength found in Table II-17.

f'_{cyl} is the actual average tested strength of the standard-cured concrete cylinder made and tested in accordance with ASTM C31 and ASTM C39.

A = full payment

B = pay reduction = $[(f'_c - f'_{cyl})/f'_c] \times \text{contract unit price for concrete per yd}^3 \times \text{number of yds}^3 \text{ the concrete represents}]$ or \$500, whichever is greater.

C = pay reduction = $[(f'_c - f'_{cyl})/f'_c] \times 5 \times \text{Contractor's invoice price for concrete per yd}^3 \times \text{number of yds}^3 \text{ the concrete represents}]$ or \$500, whichever is greater.

D = The Contractor shall submit an investigative plan stamped by a Virginia-licensed Professional Engineer outlining how the Contractor shall demonstrate that the in-place concrete meets the structural strength requirements of the design. For barriers, parapets, railings, etc., no reduction in concrete strength below 0.9 f'_c shall be allowed. For all other applications, the investigative plan must be approved by the Department's Engineer prior to the execution of the investigation. All costs associated with this investigation shall be borne by the Contractor. After the investigation is completed, a report shall be submitted to the Engineer showing the results of the analysis, testing and conclusions of the Virginia-licensed Professional Engineer and recommendations for action proposed by the Contractor to be taken with the concrete that did not meet the strength requirements. The Department retains all rights to determine if the action proposed with regard to the concrete in question is acceptable. If the Department concurs with the proposed action and the concrete meets the structural strength requirements of the design and remains in place, any price reduction will be taken by Method B if the concrete is a pay item or Method C if the concrete is not a pay item. If the concrete does not meet the structural requirements of the design, the concrete shall be removed and replaced at no cost to the Department. The maximum penalty assessed for low strength concrete left in place will be 10% as specified in Table II-17A not including the cost of the investigation and any corrective measures taken by the Contractor.

No calculated penalty less than \$500 will be assessed. The Contractor shall have the right to remove and replace concrete failing to meet specifications at the Contractor's cost.

Before concrete is placed, the Contractor shall provide a storage chamber at his expense for temporary storage of the Department's concrete cylinders. The contractor shall be responsible for maintaining the chamber such that the concrete test cylinders are kept in a continuously moist condition and within a temperature range of 60 degrees F to 80 degrees F. The chamber shall be equipped with a continuously recording thermometer accurate to ± 2 degrees F for the duration of concrete cylinder curing. The chamber shall be located in an area where the test cylinders will not be subject to vibration and shall be of sufficient size or number to store, without crowding or wedging, the required number of test cylinders as determined by the Contractor based on his plan of operations. Location of the chamber is subject to approval by the Engineer.

When use of high-early-strength hydraulic cement concrete is required, it shall conform to the requirements specified in Table II-17 except that the 28-day strength shall be obtained in 7 days. Up to 800 pounds per cubic yard of Type I, Type II or Type III cement may be used to produce high-early-strength concrete.

(c) **Concrete Temperature** shall be measured in accordance with the requirements of ASTM C1064.

(d) **Quality Assurance** for Low Permeability Concrete:

General:

At least two trial batches, using job materials, with permissible combination of cementitious materials shall be prepared, and test specimens shall be cast by the Contractor and tested by the Department for permeability and strength at least a month before the field application. The permeability samples shall be cylindrical specimens with a 4-inch diameter and at least 4-inches in length. Cylinders will be tested at 28 days in accordance with VTM 112. The test value shall be the result of the average values of tests on two specimens from each batch. Permeability values obtained from trial batches shall be 500 coulombs below the maximum values specified in Table II-17 of the Specifications to be acceptable.

Acceptance Tests:

For each set of cylinders made for compressive strength tests, two additional cylinders shall be made for the permeability test. The Department will be responsible for making and testing all permeability test specimens.

If the average permeability test result is equal to or less than the value for the specified class of concrete in Table II-17, then full payment will be made for the lot the average permeability test result represents. However, if the average permeability test result exceeds the coulomb value in Table II-17, payment for that lot of concrete shall be reduced by 0.005 percent for each coulomb above the coulomb value in Table II-17 multiplied by the bid item cost of the concrete times the number of cubic yards or cubic meters of concrete in the lot. The reduction in price will not exceed 5 percent of the bid price of the concrete. Any concrete with a coulomb value that exceeds the maximum required in Table II-17 by 1000 coulomb will be rejected. However, bridge deck concrete with any coulomb value exceeding the maximum required by over 1000 coulomb may be accepted by the Engineer at 95 percent of the bid price if the concrete in question has the required strength and meets other specification requirements, and the Contractor applies, at his own expense, an approved epoxy concrete overlay to the top of the entire deck. In such case deck grooving will not be required. Epoxy overlays over latex overlays will not be permitted. The adjustment to the roadway grade shall be made as required by the Engineer at the Contractor's expense.

Similarly, concrete in abutments and pier caps with coulomb value exceeding the maximum required in Table II-17, by more than 1000 coulomb may be accepted at 95 percent of the bid price if it has the required strength and meets other specification requirements, and the Contractor applies at his own expense, one coat of Type EP-3B and one coat of EP-3T in conformance with the requirements of Section 243.02 of the Specifications, on top of the pier cap or abutment seat.

Section 217.09(b) Ready Mixed Concrete is amended to replace the second paragraph with the following:

Each load of transit or shrink-mixed concrete shall be accompanied by Form TL-28 signed by the VDOT Certified Concrete Field Technician or a designated company representative working under the direction of the VDOT Certified Concrete Field Technician. The form shall be delivered to the Inspector at the site of the work. Loads that do not carry such information or that do not arrive in satisfactory condition shall not be used.

Section 217.09(b) Ready-Mixed Concrete is amended to replace the fourth paragraph and the table with the following:

Each batch of concrete shall be delivered to the site of work and discharged within 90 minutes of the time the cement is introduced into the mixture unless approved otherwise by the Engineer.

Section 217.09(b)1. Transit mixing is amended to replace the first paragraph with the following:

1. **Transit mixing:** Concrete shall be mixed in a truck mixer. Mixing shall begin immediately after all ingredients are in the mixer and shall continue for at least 70 revolutions of the drum or blades at the rate of at least 14 but no more than 20 revolutions per minute.

VIRGINIA DEPARTMENT OF TRANSPORTATION
2007 ROAD AND BRIDGE SUPPLEMENTAL SPECIFICATIONS

SUPPLEMENTAL SECTION 224—CASTINGS

SECTION 224—CASTINGS of the Specifications is amended as follows:

Section 224.02—Materials is amended as follows:

The following is added as the first paragraph:

All casting suppliers/manufacturers shall have an approved QA/QC plan on file with the Department. Junction boxes that are to be installed within that portion of the roadway not protected by a guardrail or barrier shall be designed in accordance with the requirements of AASHTO M306 and M105, Class 35B.

Section 224.02(b) is replaced with the following:

- (b) **Gray iron castings** used in that portion of the roadway not protected by a guardrail or barrier shall conform to the requirements of AASHTO M306 and M105, Class 35B. All other castings shall conform to AASHTO M105, Class 35B.

Section 224.02(c) is replaced with the following:

- (c) **Ductile iron castings** used in that portion of the roadway not protected by a guardrail or barrier shall conform to AASHTO M306. All other ductile iron castings shall conform to ASTM A536, Grade 60-40-18.

Section 224.03—Detail Requirements is replaced with the following:

If castings are supplied from materials conforming to Sections 224.02 (a), (d) and (e) of the Specifications, all tolerances and workmanship requirements for castings shall conform to AASHTO M306. If used in that portion of the roadway not protected by a guardrail or barrier, the load testing shall conform to the requirements of AASHTO M306. When the alternate load test is used, test bars shall be present and fully identifiable with regard to the casting lot. Each casting in a lot must have the same markings as all of the other castings in the lot; if not, each group of castings with the same markings within the original lot, becomes a new lot.

VIRGINIA DEPARTMENT OF TRANSPORTATION
2007 ROAD AND BRIDGE SUPPLEMENTAL SPECIFICATIONS

SUPPLEMENTAL SECTION 232—PIPE AND PIPE ARCHES

SECTION 232—PIPE AND PIPE ARCHES of the Specifications is amended as follows:

Section 232.02 Detail Requirements of the specifications is amended to replace the first paragraph with the following:

Concrete, corrugated steel and polyethylene pipe shall only be supplied from manufacturers currently having an approved Quality Control Plan on file with the Department.

Section 232.02(a)1.b.(6) is replaced with the following:

- (6) **Strength tests** shall be performed by the three-edge bearing method in accordance with the requirements of AASHTO T280 or by control cylinders tested in accordance with ASTM C31 and C39 or by the testing of cores in accordance with ASTM C42. Control cylinders for acceptance testing shall be cured under the same conditions as the concrete the cylinders represent. Hand cast pipe and end sections may be tested in accordance with the requirements of ASTM C31 and C39. Concrete pipe may be shipped after reaching 85 percent of design strength as determined by control cylinders or cores.

Section 232.02(a)1.b.(7) is replaced with the following:

- (7) **Absorption tests** shall be performed in accordance with the requirements of AASHTO T280 on specimens of broken pipe or cores.

Section 232.02(c)2. Asphalt-coated corrugated steel culvert pipe and pipe arches is deleted entirely.

Section 232.02-Detail Requirements is amended to add the following:

(m) **Polypropylene (PP) Pipe:**

1. **PP corrugated culvert and storm drain pipe** shall conform to the requirements of AASHTO MP 21-11, and shall be double wall pipe (Type S) for nominal diameters of 12 inches through 30 inches, inclusive, and shall be triple wall pipe (Type D) for nominal diameters of 36 inches through 48 inches, inclusive. Polypropylene Pipe less than 12 inches and greater than 48 inches in diameter will not be allowed. Fittings and joining systems shall also meet the requirements of the AASHTO MP 21-11.

VIRGINIA DEPARTMENT OF TRANSPORTATION
2007 ROAD AND BRIDGE SUPPLEMENTAL SPECIFICATIONS

SUPPLEMENTAL SECTION 238—ELECTRICAL AND SIGNAL COMPONENTS

SECTION 238 ELECTRICAL AND SIGNAL COMPONENTS of the Specifications is amended as follows:

Section 238.02(f) Electrical and Signal Junction Boxes is replaced with following:

(f) Electrical and Signal Junction Boxes:

Boxes, frames and covers shall be water resistant. Covers shall be secured with stainless steel bolts and fasteners. Covers shall be flush with surface of the junction box and not protrude above the top of the junction box flange.

Junction box bolt attachment holes shall be drilled through to prevent debris from collecting in the threaded bolt holes.

Junction boxes shall be tested and certified by an independent testing laboratory as meeting the requirements indicated herein for approval for use. Independent testing laboratory shall be approved by VDOT Materials Division prior to testing. The Contractor shall furnish the Engineer documentation of such test results.

Testing reports shall provide complete test results for the type of design testing indicated for the respective type of junction box.

Junction Boxes for deliberate traffic in the roadway applications:

- Concrete shall conform to the requirements of Section 217 of the Specifications and shall be designed to meet the provisions of AASHTO's *Standard Specifications for Highway Bridges* for HS20 loading. Concrete shall have a design minimum compressive strength of 4000 psi.
- Gray Iron frame and covers shall conform to the requirements of Section 224 of the Specifications.

Junction Boxes for off roadway applications:

- Shall conform to the requirements of ANSI/SCTE 77 2007 and tier 15 loading. Boxes shall be open bottom.
- Shall be Polymer concrete with straight sides or Polymer concrete with flared or straight fiberglass sides.
- Other materials may be submitted for the sidewalls provided they conform to the requirements of ANSI/SCTE 77 2007 and tier 15 loading.

Junction Boxes frames and covers for bridge structures encasements shall be one of the following types:

1. Steel castings conforming to the requirements of Section 224 of the Specifications, galvanized inside and out.

2. Welded sheet steel having a thickness of at least 3/16 inch or 7 gage, galvanized inside and out.
3. Polymer concrete with fiberglass sides or all polymer concrete.

Section 238.02(h)6.f. Light Emitting Diode (LED) traffic signal head sections is amended to replace the third paragraph with the following:

LED arrow traffic signal modules shall conform to the requirements of the *ITE Vehicle Traffic Control Signal Heads – Light Emitting Diode Vehicle Arrow Traffic* issued April 3, 2006 (inclusive of any ITE documents that amend, revise and/or supersede it).

And to replace the seventh paragraph with the following:

The LED's shall be mounted and soldered to a printed circuit board. Modules shall be provided with an external in-line fuse or internal fusing of the 120 VAC (+) input. The fuse shall be rated in accordance with the LED module manufacturer. The LED signal module shall utilize the same mounting hardware used to secure the incandescent lens and gasket assembly and shall only require a screwdriver or standard installation tool to complete the mounting.

VIRGINIA DEPARTMENT OF TRANSPORTATION
2007 ROAD AND BRIDGE SUPPLEMENTAL SPECIFICATIONS

SUPPLEMENTAL SECTION 247—REFLECTIVE SHEETING

SECTION 247—REFLECTIVE SHEETING of the Specifications is completely replaced with the following:

247.01—Description

This specification covers reflective sheeting used on traffic control devices to provide a retroreflective surface or message. The color of the reflective sheeting shall be as specified in the Contract Documents. Reflective sheeting shall be certified in accordance with the requirements of Section 106.06 of the Specifications.

247.02—Detail Requirements

Reflective sheeting shall be selected from the Department's Approved Products list. Reflective sheeting products are included on the Approved Products List only after the Department determines conformance to the Specifications and the manufacturer has supplied written information indicating conformance to the warranty requirements of Section 247.03 of the Specifications where required. Determination of conformance will include, but not be limited to, the evaluation of test data from AASHTO's National Transportation Product Evaluation Program (NTPEP) or other Department-approved facilities except as noted. When color test data (Chromaticity and Luminance Factor - Y%) provided by NTPEP or other Department-approved facilities are evaluated, color must have been maintained within the color specification limits for the full duration of the outdoor weathering test. The sheeting and any applied coatings such as inks, overlay films, other coatings, shall be weather resistant in accordance with ASTM D4956 after being tested by AASHTO, NTPEP or other Department approved facilities except as noted.

- (a) **Reflective sheeting used on permanent signs (except those addressed in Section b), on object markers, nose of guardrails, permanent impact attenuators (except sand barrels), standard road edge delineators, special road edge delineators, barrier delineators, guardrail delineators, interstate road edge delineators, chevron panels, bridge end panel signs (VW-13), and railroad advance warning signs (including any supplemental plaques) vertical panels (Group 2 channelizing devices), traffic gates, Automatic Flagger Assistance Device (AFAD) gate arms, and the "STOP" side of sign paddles (hand signaling device)** shall conform to the requirements of ASTM D4956 for a Type IX material and, except for the "STOP" side of sign paddles, shall be warranted in accordance with Section 247.03 Sheeting Warranty Class I of the Specifications.

Color shall conform to the requirements of 23 CFR, Part 655, Subpart F, Appendix Tables 1 and 1A (non-fluorescent colors) and Tables 3 and 3A (fluorescent colors). In Table 1A, the values for daytime luminance factor (Y%) shall be based on the colors for a Type IV, VII, and VIII sheeting.

The minimum maintained coefficient of retroreflection of the sheeting after 3 years on the test deck shall conform to the requirements of ASTM D4956.

1. **Reflective sheeting used on the following signs** shall be Fluorescent Yellow-Green conforming to the requirements of ASTM D4956 for a Type IX material and shall be warranted in accordance with Section 247.03, Sheeting Warranty Class I of the Specifications.

- Bicycle Crossing sign (W11-1) including supplemental plaques
- Pedestrian Crossing sign (W11-2) including supplemental plaques
- Playground sign (W15-1) including supplemental plaques
- DEAF CHILD AREA sign including supplemental plaques
- WATCH FOR CHILDREN sign including supplemental plaques
- School Signing consisting of the following:
 - School Crossing sign (S1-1)
 - School Bus Stop Ahead sign (S3-1)
 - SCHOOL plaque (S4-3)
 - School Portion of the School Speed Limit sign (S5-1)
 - Supplemental plaques used with these signs

Color shall conform to the requirements of 23 CFR, Part 655, Subpart F, Appendix Tables 3 and 3A.

The minimum maintained coefficient of retroreflection of the sheeting after 3 years on the test deck shall conform to the requirements of ASTM D4956.

- (b) **Reflective sheeting used on permanent recreational and cultural interest area guidance signs, and for the hand symbol/DON'T WALK and numerals on permanent educational pedestrian signal signs (R10-3b thru R10-3e)** shall conform to the requirements of ASTM D4956 for a Type III material and shall be warranted in accordance with Section 247.03, Sheeting Warranty Class I of the Specifications.

Color shall conform to the requirements of 23 CFR, Part 655, Subpart F, Appendix Tables 1 and 1A.

The minimum maintained coefficient of retroreflection of the sheeting after 3 years on the test deck shall conform to the requirements of ASTM D4956.

- (c) **Reflective sheeting used to delineate the trailer's back frame of Portable Changeable Message Signs (PCMS), Automatic Flagging Assistance Device (AFAD) gate arm, arrow boards and portable lights** shall conform to the requirements of 49 CFR 571.108 for a Grade DOT-C2 truck conspicuity marking. References to ASTM specifications therein shall be interpreted to mean the latest version of the specification at the time of advertisement regardless of the date indicated in the reference.

Color shall conform to the requirements of 23 CFR, Part 655, Subpart F, Appendix Tables 1 and 1A.

This reflective sheeting is not required to be tested by NTPEP.

- (d) **Reflective sheeting used on Type III barricades** shall conform to the following:

Minimum Coefficient of Retroreflection R_A (R_A =Candelas per foot-candle per square foot)			
Observation Angle (°)	Entrance Angle (°)	White	Orange
0.2	—4	400	200
0.2	+30	200	80
0.5	—4	300	100
0.5	+30	100	40
1.0	—4	50	25
1.0	+30	15	10

Color and Luminance Factor (Y%) shall conform to the requirements of 23 CFR, Part 655, Subpart F, Appendix Tables 1 and 1A, for a Type IV Sheeting.

Impact Resistance shall conform to the requirements of ASTM D4956.

The minimum maintained coefficient of retroreflection of the sheeting after one year on the test deck shall be at least 50 percent of the minimum coefficient of retroreflection values specified.

- (e) **Reflective sheeting used on orange construction and maintenance activity signs, barrier vertical panels installed on concrete traffic barrier service, rear panel of truck-mounted attenuators, temporary impact attenuators (except temporary sand barrels), and the "SLOW" side of sign paddles** shall conform to the requirements of ASTM D4956 for a Type IX, Fluorescent Orange material (with the following retroreflection exception):

Minimum Coefficient of Retroreflection R_A (R_A =Candelas per foot-candle per square foot)		
Observation Angle (°)	Entrance Angle (°)	Fluorescent Orange
0.2	−4	140
0.2	+30	90
0.2	+40	24
0.5	−4	90
0.5	+30	50
0.5	+40	15
1.0	−4	10
1.0	+30	5
1.0	+40	3

Color shall conform to the requirements of 23 CFR, Part 655, Subpart F, Appendix Tables 3 and 3A.

The minimum maintained coefficient of retroreflection of the sheeting after one year on the test deck shall be at least 50 percent of the minimum coefficient of retroreflection values specified.

- (f) **Reflective sheeting used on tubular delineators, drums and temporary sand barrels** shall conform to the following:

1. **Reflective sheeting used on tubular delineators and drums** shall conform requirements of ASTM D4956 including supplementary requirement S2 for a Type III reboundable material. Color shall conform to the requirements of Tables 1 and 1A of the USDOT specification as contained in the Appendix to 23 CFR, Part 655, Subpart F except the minimum daytime luminance factor (Y%) for white shall be 25 when used on tubular delineators and drums. The following supplementary table shall apply for tubular delineators and drums:

Minimum Coefficient of Retroreflection R_A (Candelas per foot-candle per square foot) (High Intensity)			
Observation Angle (°)	Entrance Angle (°)	White	Orange

0.2	+50	75	25
0.5	+50	35	10

Reflective sheeting used on tubular delineators is not required to be tested by NTPEP.

2. **Reflective sheeting used on temporary sand barrels** shall be a fluorescent orange prismatic lens reboundable sheeting conforming to the following:

Color shall conform to the requirements of Tables 3 and 3A of the USDOT specification as contained in the Appendix to 23 CFR, Part 655, Subpart F.

Minimum Coefficient of Retroreflection R_A (Candelas per foot-candle per square foot) (High Intensity)		
Observation Angle (°)	Entrance Angle (°)	Fluorescent Orange
0.2	-4	200
0.2	+30	120
0.2	+50	40
0.5	-4	80
0.5	+30	50
0.5	+50	30

Minimum maintained coefficient of retroreflection of the sheeting after one year on the test deck shall be at least 50 percent of the minimum coefficient of retroreflection values indicated above.

Reflective sheeting shall conform to the supplementary requirement S2 of ASTM D4956.

Please note: Beginning July 1, 2012 reflective sheeting used on Drums, Temporary Sand Barrels and Tubular delineators for all projects shall conform to the requirements of ASTM D4956 including supplementary requirement S2 for a Type III reboundable material with the following retroreflection exception as shown in the chart below:

Minimum Coefficient of Retroreflection R_A (R_A =Candelas per foot-candle per square foot) (Prismatic Lens)			
Observation Angle (°)	Entrance Angle (°)	White	Fluorescent Orange
0.2	-4	400	175
0.2	+30	200	100
0.2	+40	135	60
0.2	+45	120	40
0.5	-4	150	70
0.5	+30	50	30
0.5	+40	45	25
0.5	+45	40	20

Color shall conform to the requirements of 23 CFR, Part 655, Subpart F, Appendix Tables 1 and 1A (non-fluorescent colors) and Table 3 and 3A (fluorescent colors).

The minimum maintained coefficient of retroreflection of the sheeting after one year on the test deck shall be at least 50 percent of the minimum coefficient of retroreflection specified.

- (g) **Reflective sheeting used on Permanent Sand Barrels and on Cones** shall conform to the requirements of ASTM D4956 including supplementary requirement S2 for a Type III reboundable material. The following supplementary table shall also apply for cones:

Minimum Coefficient of Retroreflection R_A (R_A =Candelas per foot-candle per square foot) (High Intensity)		
Observation Angle (°)	Entrance Angle (°)	White
0.2	+50	60
0.5	+50	35

Color shall conform to the requirements of 23 CFR, Part 655, Subpart F, Appendix Tables 1 and 1A.

The maintained coefficient of retroreflection of the sheeting after one year on the test deck shall be at least 50 percent of the minimum coefficient of retroreflection specified for permanent sand barrel sheeting.

Reflective sheeting for cones is not required to be tested by NTPEP.

- (h) **Reflective sheeting used on Retroreflective Rollup Signs** shall conform to the following:

Minimum Coefficient of Retroreflection R_A (R_A =Candelas per foot-candle per square foot) (Prismatic Lens)				
Observation Angle (°)	Entrance Angle (°)	White	Fluorescent Orange	Fluorescent Pink
0.2	-4	500	200	200
0.2	+30	200	80	100
0.5	-4	225	90	100
0.5	+30	85	35	35
1.0	-4	20	10	10
1.0	+30	15	8	10
1.5	-4	5	3	2
1.5	+30	4	1.5	2

Color shall conform to the requirements of 23 CFR, Part 655, Subpart F, Appendix Tables 1 and 1A for white, and Appendix Tables 3 and 3A for fluorescent colors.

Reflective sheeting for retroreflective rollup signs is not required to be tested by NTPEP.

247.03—Warranty Requirements

The reflective or retroreflective sheeting manufacturer shall provide the following warranty to the Department for the respective types of sheeting furnished as specified herein:

Class I Warranty: 10-year warranty with 7 years being 100 percent full replacement covering all material and labor costs associated with fabrication and installation of the sign or device and the final 3 years being 100 percent sheeting replacement cost.

The minimum values of retroreflectivity maintained during the warranty period shall be the same as those required for the maintained coefficient of retroreflection values as indicated herein, or where not indicated, shall be in accordance with those specified in ASTM D4956.

Loss of colorfastness is considered to have occurred if the color of the sheeting is not within the color specification limits in 23 CFR, Part 655, Subpart F, Appendix during the full duration of the warranty period.

Warranty period shall begin on the date of fabrication and shall be documented as follows:

For warranty requirements, each permanent sign shall be labeled on the reverse in a location not to be obscured by sign supports or backing hardware, showing 1.) Month and year the sign was fabricated, marked via punch-out numerals, 2.) Sheeting Manufacturer's name or logo and product designation or number, and 3.) Sign fabricator's name or logo. Labels shall be made of a self adhesive, permanent weather resistant material and shall be a minimum 4" by 4" in size. Label may be made from permanent sign material provided the finished label meets all other aspects required for warranty documentation.

Where the information required for the label is not furnished by punched-out numerals, it shall be supplied by permanent means, such as sign ink, capable of resisting weathering so as to be legible for the full duration of the warranty period.

Prior to applying the label, the area shall be thoroughly cleaned to ensure proper adhesion.

— **DIVISION III – ROADWAY CONSTRUCTION** —

**SPECIAL PROVISION COPIED NOTES (SPCNs), SPECIAL PROVISION (SPs) and
SUPPLEMENTAL SPECIFICATIONS (SSs)**

— **STANDARD 300 SERIES SPCNs, SPs, and SSs** —

(c302h00-0708) **SECTION 302.03(b) PRECAST DRAINAGE STRUCTURES** of the Specifications is amended to include the following:

Precast units, excluding concrete pipe, prestressed concrete items and soundwalls, conforming to the requirements herein will only be accepted under a Quality Control/Quality Acceptance Program (QC/QA). The Contractor shall have the producer perform quality control functions in accordance with a Department approved QC/QA plan. Each piece, manufactured under the QC/QA program, in addition to the date and other required markings, shall be stamped with the letters (QC), as evidence that the required QC/QA procedures have been performed. Each shipping document shall be affixed with the following:

We certify that these materials have been tested and conform to VDOT Precast Concrete Products Quality Assurance Program

Signature and Title

1-14-08 (SPCN)

VIRGINIA DEPARTMENT OF TRANSPORTATION
SPECIAL PROVISION FOR
RESTORING EXISTING PAVEMENT

January 14, 2008cc

I. DESCRIPTION

This work shall consist of restoring existing pavement, removed for installation or repair of utilities such as, but not limited to pipe culverts, conduits, water and sanitary sewer items.

II. MATERIALS

Asphalt Concrete shall conform to the requirements of Section 211 of the Specifications.

Aggregate Subbase material shall conform to the requirements of Section 208 of the Specifications.

Asphalt Material shall conform to the requirements of Section 210 of the Specifications.

Fine Aggregate shall conform to the requirements of Section 202 of the Specifications.

Coarse Aggregate for surface treatment shall conform to the requirements of Section 203 of the Specifications.

Hydraulic Cement Concrete Class A3 shall conform to the requirements of Section 217 of the Specifications.

Steel Reinforcement shall conform to the requirements of Section 223 of the Specifications.

III. PROCEDURES

Pavement restoration shall be in accordance with this Provision and plan notes.

Backfill shall be in accordance with Section 302.03(a)2.g. of the Specifications.

Asphalt Concrete shall be placed and compacted in accordance with Section 315 of the Specifications.

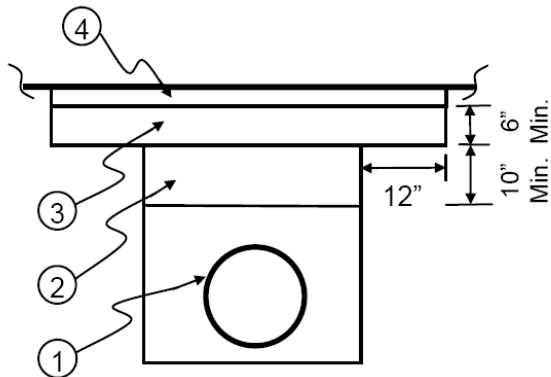
Surface Treatment shall be placed in accordance with the Asphalt Surface Treatment special provision and the attached drawing.

Concrete Pavement shall be placed in accordance with Section 509 of the Specifications and this special provision. Open trench in Hydraulic Cement Concrete Pavement should be located at existing transverse joints if at all possible. If concrete pavement is removed within two feet of an existing transverse joint, pavement removal shall be extended two feet beyond the joint. Reinforcing steel and dowels shall be installed in accordance with Road and Bridge Standard PR-2. Joint replacement shall be in accordance with Road and Bridge Standard PR-2.

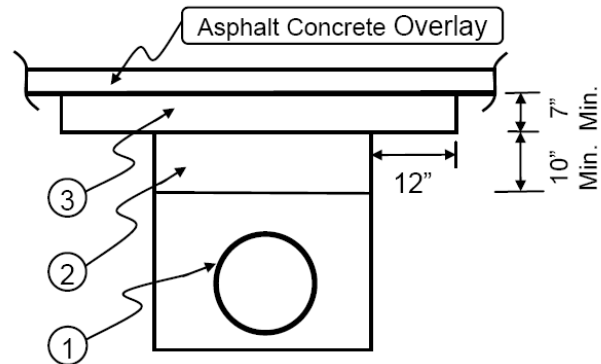
IV. MEASUREMENT AND PAYMENT

Restoring Existing Pavement unless otherwise specified will not be measured for separate payment, the cost thereof shall be included in the price bid for the utility to which it pertains in accordance with Section 302.04, Section 520.06 or Section 700.05 of the Specifications, as appropriate. However, widths and depths in excess of the attached drawing that are authorized

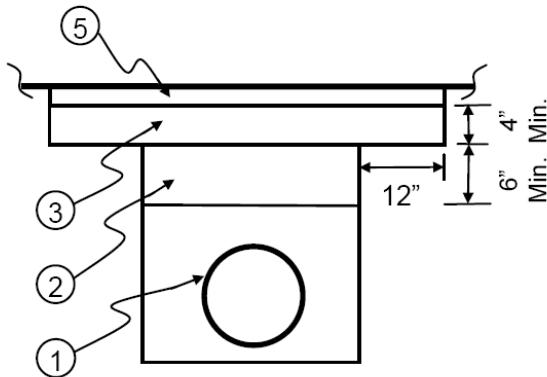
or directed by the Engineer will be paid for in accordance with Section 109.05 of the Specifications.



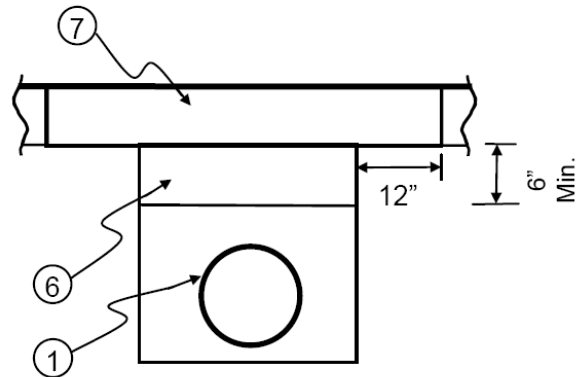
PAVEMENT STRUCTURE
Asphalt Conc. Base and Surface



PAVEMENT STRUCTURE
Scheduled for Asphalt Conc. Overlay



PAVEMENT STRUCTURE
Aggregate Base and Surface Treatment



PAVEMENT STRUCTURE
Hydraulic Cement Concrete

NOTES:

The following methods for restoring existing pavement shall be adhered to unless otherwise specified on the plans.

1. Pipe culverts, conduits and utility items shall be installed in accordance with the applicable Road and Bridge Standards and Specifications.
2. Subbase - Aggregate material Type 1, Size 21A or 21B.
3. Asphalt Concrete Type BM-25.0
4. Surface - Asphalt Concrete Type SM-9.5D @ 165 lbs. per sq. yd.
5. Surface - Blotted Seal Coat Type C: The initial seal and final seal shall be CRS-2, CMA-2 or CMS-2h liquid asphalt material @ 0.17 gal./sq. yd. with 15 lbs. of No. 8P stone/sq. yd. each. The blot seal shall be CRS-2, CMS-2 or CMS-2h liquid asphalt material @ 0.15 gal./sq. yd. with 10 lbs. of fine aggregate grade B sand per sq. yd.
6. Subbase - Aggregate material Type 1 Size 21B
7. Surface - Hydraulic Cement Concrete, high early strength, matching existing structure for depth and surface texture.

VIRGINIA DEPARTMENT OF TRANSPORTATION
SPECIAL PROVISION FOR
FLOWABLE BACKFILL

March 11, 2010

I. DESCRIPTION

This work shall consist of furnishing and placing flowable backfill for use as backfill material in pipe installations or in other uses at locations as designated on the plans, and as backfill material for plugging designated abandoned pipes and culverts.

II. MATERIALS

Hydraulic Cement shall conform to the requirements of Section 214 of the Specifications.

Fly Ash shall conform to the requirements of Section 241.02(a) of the Specifications.

Water shall conform to the requirements of Section 216 of the Specifications with the exception that wash water as described in Section 216.02 may comprise the total mix water.

Aggregates shall conform to the requirements of Sections 202 and 203 of the Specifications with a combined gradation as determined by the Contractor.

Admixtures shall conform to the requirements of Section 215 of the Specifications.

Granulated Iron Blast Furnace Slag shall conform to the requirements of Section 215 of the Specifications.

III. MIX DESIGN

Mix design for flowable backfill shall be provided by the Contractor. When used as backfill material in pipe installations or in other uses at locations as designated on the plans flowable backfill shall have a design compressive strength of 30 to 200 pounds per square inch. When used as backfill material for plugging designated abandoned pipes and culverts flowable backfill shall have a design compressive strength of 30 to 1200 pounds per square inch. The design compressive strength requirement shall be at 28 days when tested in accordance with ASTM D 4832. Mix design shall result in a fluid product having no less than an 8-inch slump at time of placement. The Contractor shall submit a mix design for approval supported by laboratory test data verifying compliance with 28 day compressive strength requirements. Mix design shall be approved by the Engineer prior to placement.

IV. PROCEDURES

Mixing and transporting shall be in accordance with Section 217 of the Specifications or by other methods approved by the Engineer.

Temperature of flowable backfill shall be at least 50 degrees F at time of placement. Material shall be protected from freezing for 24 hours after placement.

When used as backfill for pipe installation and floatation or misalignment occurs, correct alignment of the pipe shall be assured by means of straps, soil anchors or other approved means of restraint.

When used to fill the voids in abandoned pipes and culverts, they shall be plugged and backfilled in accordance with the plan details or as directed by the Engineer. The plugs shall be in accordance with the plan details. The backfill material shall be flowable backfill placed into the abandoned pipe or culvert without voids. When deemed necessary by the Engineer, the Contractor shall submit a plan of operations for acceptance showing how the flowable backfill will be placed without voids. The opening for culvert backfill installation shall be sealed with masonry or Class A-3 concrete at completion of backfilling.

V. MEASUREMENT AND PAYMENT

Flowable Backfill will be measured and paid for in cubic yards complete-in-place. When used as backfill material in pipe installations or in other uses at locations as designated on the plans this price shall be full compensation for furnishing and placing flowable backfill, securing the pipe alignment, and for all materials, labor, tools, equipment and incidentals necessary to complete the work. When used as backfill material for plugging designated abandoned pipes and culverts the price bid shall include furnishing and placing of backfill material and furnishing and installing plugs.

Payment will be made under:

Pay Item	Pay Unit
Flowable Backfill	Cubic yard

**VIRGINIA DEPARTMENT OF TRANSPORTATION
SPECIAL PROVISION FOR
NONTRACKING TACK COAT**

October 5, 2010c

I. DESCRIPTION

This work shall consist of preparing and treating an existing asphalt or concrete surface with asphalt in accordance with the requirements of these specifications and in conformity with the lines shown on the plans or as established by the Engineer.

II. MATERIALS

Liquefied asphalt materials for non-tracking tack coat must be on the Department's list of approved non-tracking tack coat materials. Non-tracking tack coat materials shall not be diluted with water.

III. PROCEDURES

Nontracking Tack will be required only between May 1 and October 1. Tack coat, in accordance with Section 310 of the Specifications, may be used at other times.

Equipment for heating and applying asphalt shall conform to the requirements of Section 314.04(b) of the Specifications or the non-tracking tack coat material's manufacturer's recommendations. The maximum application temperature of liquefied asphalt shall conform to the manufacturer's requirements.

The existing surface shall be patched when necessary, cleaned, and rendered free from irregularities to the extent necessary to provide a reasonably smooth and uniform surface. Unstable corrugated or deteriorated areas of existing pavement shall be removed and replaced with suitable patching materials. The edges of existing pavements that will be adjacent to new pavement shall be thoroughly cleaned to permit adhesion of asphalt.

Tack material shall be uniformly applied with a pressure distributor conforming to the requirements of Section 314.04(b) of the Specifications. Hand spray equipment shall not be used except in areas inaccessible by a pressure distributor. The tack material shall be applied at a rate recommended by the manufacturer. This rate is typically between 0.05 to 0.10 gallons per square yard. The asphalt tack shall be applied to the pavement surface in such a manner that it will bond the overlay and the underlying surfaces together.

Application of tack at joints, adjacent to curbs, gutters, or other appurtenances shall be uniformly applied with a hand wand or with a spray bar at the rate of 0.2 gallon per square yard.

The tack coat shall be applied in a manner to offer the least inconvenience. All traffic, including construction traffic, shall be excluded from sections treated with non-tracking tack until the tack has cured and will no longer track onto adjacent non-treated areas.

The tack coat shall be applied in accordance with the same weather limitations that apply to the course being placed as well as the manufacturer's recommendations. The quantity, rate of application, temperature, and areas to be treated shall be approved by the Engineer prior to application of the tack coat.

Adjacent concrete or asphalt concrete surfaces shall show minimal visible evidence and white or yellow pavement markings shall show no visible evidence of tracking of the asphalt tack material

at the end of the production shift. Tracking of the tack material on pavement markings will require the Contractor to immediately restore the marking to their original pre-tack condition. Build-up of the tacking material on existing pavement surfaces shall be removed by the Contractor.

During the application of non-tracking asphalt tack coat, care shall be taken to prevent spattering adjacent items or vehicular traffic. The distributor shall not be cleaned or discharged into ditches or borrow pits, onto shoulders, or along the right of way. When not in use, application equipment shall be parked so that the spray bar or mechanism will not drip asphalt on the surface of the traveled way.

IV. REFEREE SYSTEM

When the new asphalt course is placed on a milled or non-milled surface, the Contractor shall take steps to ensure an adequate bond between the new material and existing surface. If the Engineer suspects the Contractor is failing to apply good bond promoting procedures or adequately tacking the existing surface per the manufacturer's recommendations, the Department may core a minimum of 6 locations to determine the shear and tensile strength at the interface. These locations will be determined through a stratified random selection process. Cores will be tested in the Department's laboratory in accordance with the procedures described in report VTRC 09-R21. For the surface to be acceptable, the average results for shear and tensile strength must be met. A minimum of 3 cores will be tested for shear and 3 cores for tensile strength. The average shear strength must meet or exceed 100 psi with no single core having a shear strength less than 50 psi on a milled surface. The average shear strength must meet or exceed 50 psi with no single core having a shear strength less than 30 psi on a non-milled surface. The average tensile strength of the remaining cores must meet or exceed 40 psi with no single core having a tensile strength less than 20 psi on a milled surface. The average tensile strength of the remaining cores must meet or exceed 30 psi with no single core having a tensile strength less than 20 psi on a non-milled surface. In the event the minimum shear or tensile strength requirements are not met, then payment for the asphalt concrete tonnage placed in the area in dispute shall be reduced by 10 percent.

V. MEASUREMENT AND PAYMENT

Nontracking tack coat, the cost thereof, shall be included in the price for other appropriate pay items.

Patching will be paid for at the contract unit price for the various items used unless a reconditioning item is included in the Contract.

VI. REFERENCES

McGhee, K.K , and Clark, T.M. *Bond Expectations for Milled Surfaces and Typical Tack Coat Materials Used in Virginia*. VTRC 09-R21. Virginia Transportation Research Council, Charlottesville, 2009.

VIRGINIA DEPARTMENT OF TRANSPORTATION
SPECIAL PROVISION FOR
SURFACE PREPARATION AND RESTORATION PRIOR TO PLANT MIX OVERLAY

February 2, 2011

I. DESCRIPTION

This work shall consist of removing deteriorated pavement, cleaning the area and repairing with the appropriate asphalt mixes in areas designated by the Engineer. This work is applicable only to the routes or areas designated to be overlaid in this contract and where the Engineer has authorized the limits for preparation and restoration. This preparation and restoration will be accomplished prior to the overlay paving operation. After the preparation, the Contractor will be responsible for maintaining the prepared surface until the overlay has been completed.

Definitions: For the purpose of the Specifications surface preparation is defined as the following:

- TYPE I -** A localized disintegration of the pavement, including distorted areas, no more than 5 inches in depth and no more than 20 square feet in surface area.
- TYPE II -** A localized disintegration of pavement, including distorted areas, no more than 5 inches in depth and more than 20 square feet in surface area.
- TYPE III -** A localized disintegration more than 5 inches in depth, limits of surface area as defined by the Engineer.

II. MATERIALS

Surface preparation and restoration material shall be as follows:

For 0-2 inches - use surface mix

For 2-5 inches - use intermediate mix

For greater than 5 inches - use base mix or intermediate mix

Tack coat shall conform to the requirements of Section 210 of the Specifications.

III. PROCEDURES

The Engineer will designate the limits of surface area for preparation and restoration to be achieved prior to beginning the work.

Areas designated for surface preparation and restoration shall be thoroughly cleaned, unsuitable material removed and edges shaped to vertical sides prior to applying tack coat.

A tack coat shall be applied to all exposed surfaces of the area which will receive asphalt material.

The Contractor shall utilize the mix and type of asphalt for surface preparation and restoration in accordance with Section II Materials that he shall use with that route's overlay. Asphalt material shall be placed in lifts of no more than 3 inches in depth. After leveling each lift, it shall be compacted with an approved mechanical tamper or other approved method. Care shall be taken to ensure the surface of the finished repaired area conforms to the grade of the surrounding pavement.

IV. MEASUREMENT AND PAYMENT

When the bid proposal contains a pay item, corresponding to any of the types below, specified in the "Schedule of Items"; that type of surface preparation and restoration will include the work designated in the corresponding type's description and be paid for in accordance with the price designated by the bidder. If the bid proposal contains no pay item for the type of surface preparation and restoration as described herein, such as may be discovered in the field; that surface preparation and restoration shall meet the definition of Section I and will be measured and paid for in accordance with the following:

Surface Preparation and Restoration Type I will be measured in tons of asphalt material and paid for at the rate of three times the contract unit bid price per ton of the mix type(s) of asphalt authorized by the Engineer. This price shall include removing and disposing of unsuitable material, preparing the area, furnishing and applying tack coat, furnishing and applying asphalt material, and compaction.

Surface Preparation and Restoration Type II will be measured in tons of asphalt material and paid for at the rate of four times the contract unit bid price per ton of the mix type(s) of asphalt authorized by the Engineer. This price shall include removing and disposing of unsuitable material, preparing the area, furnishing and applying tack coat, furnishing and applying asphalt material, and compaction.

Surface Preparation and Restoration Type III will be measured in tons of asphalt material and paid for at the rate of five times the contract unit bid price per ton of the mix type(s) of asphalt authorized by the Engineer. This price shall include removing and disposing of unsuitable material, preparing the area, furnishing and applying tack coat, furnishing and applying asphalt material, and compaction.

VIRGINIA DEPARTMENT OF TRANSPORTATION
SPECIAL PROVISION FOR
PLACEMENT OF ASPHALT CONCRETE OVERLAYS

September 27, 2011

I. DESCRIPTION

This work shall consist of furnishing and placing asphalt concrete overlay pavement courses on existing roadway surfaces in accordance with the requirements herein and in conformity with the lines, grades, and thickness as established in the Contract or directed by the Engineer. This work shall be performed in accordance with the requirements of Section 211 and Section 315 of the Specifications, and where Stone Matrix Asphalt (SMA) is specified in the Contract, Sections 248 and 317 of the Specifications.

II. EQUIPMENT

Equipment for placing asphalt concrete overlay material shall be in accordance with the requirements of Section 315.03 of the Specifications and where Stone Matrix Asphalt (SMA) is specified, Section 317 of the Specifications.

III. PROCEDURES

Where pavement planing is required it shall be performed in accordance with the requirements of the Special Provision for Cold Planing (Planing) Asphalt Concrete Operations and Section 515 of the Specifications. No placement of an overlay or deck planing will be permitted on a bridge deck without the prior written approval of the District Bridge Engineer.

Limitations of operations for placing asphalt concrete overlay shall be in accordance with the requirements of Section 108.02 of the Specifications, the Contract requirements and as specified herein.

Prior to commencement of paving overlay operations the Contractor shall clean the existing pavement surface to the satisfaction of the Engineer of accumulated dust, mud, or other debris that may adversely affect the bond of the new overlay. In the event the thoroughness of the Contractor's efforts to clean the existing pavement is questionable, the Engineer may require the Contractor to perform a bond strength test in accordance with the referee system requirements in the Special Provision for Nontracking Tack Coat included in the Contract. The cost for cleaning and surface preparation shall be included in the bid price for the asphalt concrete.

The following will be corrected by the Engineer ahead of the Contractor's operations or included in the work performed by the Contractor. When such corrective work is performed by the Contractor, the work will be paid for as designated by the specific pay item(s) in the Contract:

- Pavement irregularities greater than 1 inch in depth shall be filled with a material approved by the Engineer.
- Pavement cracks or joints shall be cleaned and filled in accordance with the Special Provision for **SEALING CRACKS IN ASPHALT CONCRETE SURFACES OR HYDRAULIC CEMENT CONCRETE PAVEMENT.**

The Contractor shall remove thermoplastic and tape pavement markings and raised pavement markers prior to performing paving overlay operations. Thermoplastic and tape pavement markings shall be 90 percent removed so as not to interfere with bonding of pavement overlay or the transfer of existing marking thickness up through the overlay. In lieu of grinding to eradicate thermoplastic, the Contractor will be permitted to mechanically scrape off thermoplastic markings to a point where such markings are flush with the existing pavement surface employing adequate controls so as not to damage the affected pavement. This work shall be performed in accordance with the requirements of Section 512 and Section 704 of the Specifications except as otherwise permitted herein.

The Contractor shall protect and reference utility structures prior to paving in order to locate and adjust these structures, if necessary, after paving operations are completed. The protection and referencing of utility structures shall be at no cost to the Department.

Temporary transverse pavement-wedge tie-ins shall be constructed where pavement overlay operations are temporarily halted as allowed or required herein, in Section 315 of the Specifications, elsewhere in the contract documents, or by the Engineer. Each temporary tie-in shall be no less than 3 feet in length for every inch of depth of overlaid pavement and shall consist of a mix that is suitable as a surface mix asphalt to provide a smooth transition between the installed overlay and existing pavements or bridge decks. Such temporary tie-ins shall be constructed prior to the overlaid pavement being opened to traffic.

Final transverse pavement tie-ins shall be constructed to provide a smooth transition between newly overlaid pavement and existing pavements or bridge decks, and to existing pavement underneath bridge overpasses. Such tie-ins shall conform to the requirements of Standard Drawing ACOT-1 or Section 315.05(c) of the Specifications, as applicable, except that all joints at tie-in locations shall be tested using a 10-foot straightedge in accordance with the requirements of Section 315.07(a) of the Specifications. The variation from the testing edge of the straightedge between any two contact points with the pavement surface shall not exceed 1/4 inch. When planing is necessary at tie-ins to existing pavement or bridge decks to obtain the required overlay depth specified in the Contract; the existing pavement shall be planed in accordance with the requirements of the ACOT-1 Standard or the requirements mentioned herein.

No pavement overlay shall decrease the vertical clearance under a bridge. In situations where the pavement under the overpass cannot be planed in direct proportion to the overlay to be placed, the new pavement is to be tied down to the existing pavement under the overpass a minimum of 75 feet from the outer edges of the bridge overpass in accordance with Standard Drawing ACOT-1.

The ACOT-1 Standard for asphalt concrete overlay transitions shall apply when:

There is at least one inch of grade change between the finished asphalt concrete overlay surface and the existing pavement surface and where any of the following conditions exist:

- a. Bridge decks or bridge overpasses are located within the site to receive the overlay.
- b. Where the Contractor has to tie-in the top course of asphalt concrete overlay to an existing hydraulic concrete pavement surface.
- c. Where the Contractor has to tie-in the top course of the asphalt concrete overlay to an existing asphalt concrete pavement surface and planing is included in the Contract as pay item.

When tying in the top course of the asphalt concrete overlay to an existing asphalt concrete pavement surface and there is no pay item in the Contract for planing, the asphalt concrete overlay tie-in shall conform to the requirements of Section 315.07 (a) of the Specifications

When the Special Provision for Rideability applies as specified in the Contract, a distance of 105 feet (0.02 of a mile), measured from the line of the tie in will be exempted from pay adjustment.

The following restrictions, based on the type of roadway, will apply:

Roadways with Posted Speed Limit of 55 Mph or Greater

The Contractor shall install asphalt concrete overlays to the depths specified for the specific routes identified in the Contract. Where asphalt concrete is being overlaid to a depth of 2 inches or less on roadways carrying traffic, the Contractor shall have the option of squaring up the overlay operation at the end of each workday or squaring up all travel lanes, excluding shoulders, before the weekend. Shoulders must be squared up within 48 hours after the weekend and prior to continuing mainline paving. All lanes including shoulders must be squared up before holidays or any temporary shutdowns.

Where overlays of more than 2 inches are being placed the Contractor shall square up the overlay operation at the end of each workday. This requirement shall apply to travel lanes and shoulders.

Asphalt concrete pavement overlay operations shall be performed in only one travel lane at a time. Under no circumstance will the Contractor be permitted to overlay a portion of the width of a travel lane, ramp or loop and leave it exposed to traffic.

Where uneven pavement joints exist either transversely or longitudinally at the edges of travel lanes due to the overlay operations, the Contractor shall provide advance warning signage and traffic control devices in accordance with the details provided in the Contract to inform the traveling public for the scope of overlay operation he is performing. The cost for such advance warning devices and signage shall be included in the cost of other appropriate items. Temporary pavement markings required as a result of staging such operations will be measured and paid for in accordance with the Special Provision for **TEMPORARY CONSTRUCTION AND PERMANENT PAVEMENT MARKINGS** included in the Contract.

In the event an emergency or an unforeseen circumstance such as equipment failure or breakdown occurs during the Contractor's operations that prevents the Contractor from squaring up the overlaid surface on adjacent lanes prior to a weekend, a holiday or a temporary shutdown, any additional signage required to protect the traveling public shall be the Contractor's expense.

Ramps, exits and turn lanes are to be paved in such a manner that a longitudinal joint with a surface elevation of 1 inch or more between the existing pavement and the overlay (where the overlay is the higher of the two elevations) will not be left for vehicles to cross within the posted speed limits in a "run-on" situation. Ramps, exits and turn lanes are to be paved to the extent that the joint crossed by traffic is traversed at an angle close to 90 degrees (perpendicular), or the ramp, exit and turn lane shall be squared up with the adjacent mainline lane at the time of installation.

Only approved mixes that have been verified in accordance with the requirements of Section 211.03(f) of the Specifications and have met the requirement for roller pattern density shall be placed on limited access roadways.

The Contractor shall ensure positive drainage is provided for all overlaid surfaces in accordance with the requirements of Section 315.05(c) of the Specifications.

B. All Other Roadways

Where asphalt concrete is being overlaid to a depth of 2 inches or less on roadways carrying traffic, the Contractor shall have the option of squaring up the overlay operation at the end of each workday or squaring up all lanes including shoulders at least once every 4 consecutive workdays excluding weekends. All lanes including shoulders must be squared up before weekends, holidays or any temporary shutdowns.

Where overlays of more than 2 inches are being placed the Contractor shall square up the overlay operation at the end of each workday. This requirement shall apply to travel lanes and shoulders.

Asphalt concrete pavement overlay operations shall be performed in only one travel lane at a time. Under no circumstance will the Contractor be permitted to overlay a portion of the width of a travel lane, ramp or loop and leave it overnight.

Where uneven pavement joints exist either transversely or longitudinally at the edges of travel lanes due to the overlay operations, the Contractor shall provide advance warning signage and traffic control devices at his expense to inform the traveling public in accordance with the details provided in the Contract for the scope of overlay operation he is performing.

In the event an emergency or an unforeseen circumstance such as equipment failure or breakdown occurs during the Contractor's operations that prevents the Contractor from squaring up the overlaid surface on adjacent lanes prior to a weekend, a holiday or a temporary shutdown, any additional signage required to protect the traveling public shall be the Contractor's expense

Overlay tie-in requirements to intersecting roads or streets shall be in accordance with the Special Provision for LIMITS OF MAINLINE OVERLAY AT INTERSECTIONS TO PAVED ROADS.

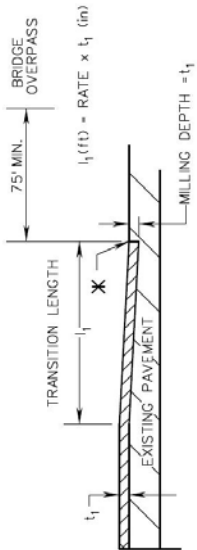
The Contractor shall ensure positive drainage is provided for all overlaid surfaces in accordance with the requirements of Section 315.05(c) of the Specifications.

(STANDARD DRAWING ACOT-1 is attached)

NOTES

1. TIE-IN REQUIREMENTS TO INTERSECTING ROADS OR STREETS SHALL BE IN ACCORDANCE WITH THE CONTRACT DOCUMENTS OR AT THE DIRECTION OF THE ENGINEER.
2. EXISTING PAVEMENT SURFACE SHALL BE PLANED TO TRANSITION THE TOP COURSE OF THE ASPHALT CONCRETE OVERLAY. ANY SUB-COURSE TERMINATION MAY BE NOTCHED INTO THE EXISTING PAVEMENT OR BLENDED WITH THE NEXT COURSE OF PAVEMENT.
3. WHEN THERE IS A SPECIAL PROVISION FOR RIDEABILITY INCLUDED IN THE CONTRACT, A DISTANCE OF 105 FEET (0.02 OF A MILE) MEASURED FROM THE LINE OF THE TIE-IN WILL BE EXEMPTED FROM PAY ADJUSTMENT.
4. TRANSITION SHALL BEGIN/END AT THE PROJECT LIMITS, AT BRIDGE APPROACH SLAB/ABUTMENT (OR AN INTERMEDIATE POINT DETERMINED BY THE ENGINEER), AND A MINIMUM OF 75 FEET FROM A VERTICAL PLANE OF THE NEAREST OUTER FACE OF THE BRIDGE OVERPASS.
5. NO OVERLAY OR MILLING SHALL BE PERMITTED ON THE BRIDGE DECK WITHOUT THE PRIOR WRITTEN APPROVAL OF THE DISTRICT BRIDGE ENGINEER.

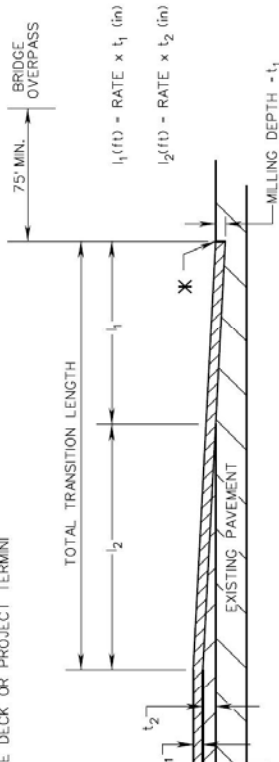
ACOT-1



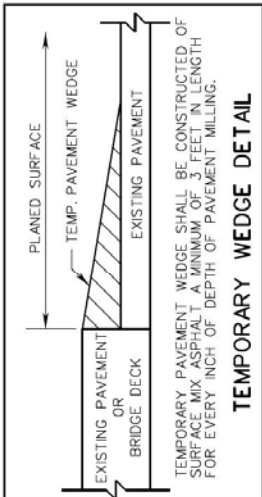
**SINGLE COURSE OVERLAY
TRANSITION GEOMETRY**
(NOT TO SCALE)

✕ BRIDGE DECK OR PROJECT TERMINI

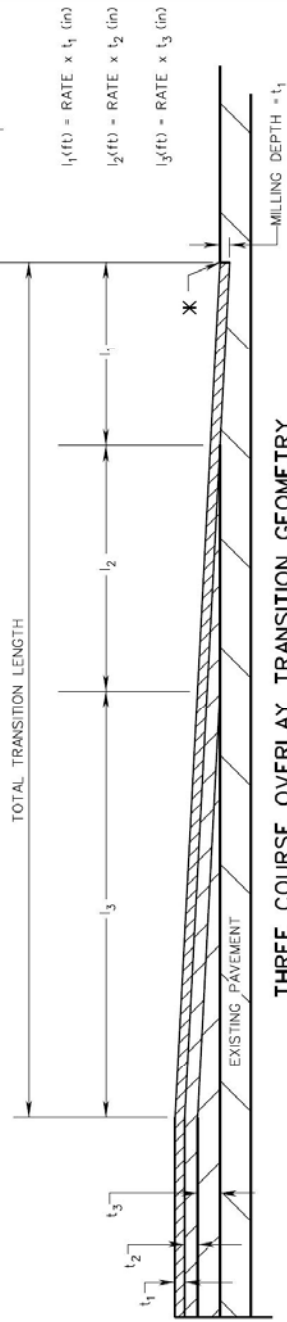
TRANSITION RATE		POSTED SPEED MPH				
RATE (FT/INCH)	25	35	45	55	65	70
	20	25	35	40	45	50



TWO COURSE OVERLAY TRANSITION GEOMETRY
(NOT TO SCALE)



TEMPORARY WEDGE DETAIL



THREE COURSE OVERLAY TRANSITION GEOMETRY
(NOT TO SCALE)

SPECIFICATION REFERENCE
210
315
515

A COPY OF THE ORIGINAL SEALED AND SIGNED DRAWING IS ON FILE IN THE CENTRAL OFFICE.
ASPHALT CONCRETE OVERLAY TRANSITIONS

VDOT ROAD AND BRIDGE STANDARDS	
REVISION DATE	SHEET 1 OF 1
SPECIAL DESIGN	

VIRGINIA DEPARTMENT OF TRANSPORTATION

**VIRGINIA DEPARTMENT OF TRANSPORTATION
SPECIAL PROVISION FOR
LIMITS OF MAINLINE OVERLAY AT INTERSECTIONS TO PAVED ROADS**

July 28, 2010

I. DESCRIPTION

This work shall consist of furnishing and placing asphalt concrete overlay pavement courses on existing paved roadway surfaces that intersect the mainline roadway pavement overlay. This work shall be performed in accordance with the requirements of the Special Provision for Placement of Asphalt Concrete Overlays, Sections 211 and 315 of the Specifications; and where Stone Matrix Asphalt (SMA) is specified in the Contract, Sections 248 and 317 of the Specifications; and as specified herein. Where pavement planing is required it shall be performed in accordance with the requirements of the Special Provision for Cold Planing (Milling) Asphalt Concrete Operations and Section 515 of the Specifications and as specified herein.

II. MATERIALS

Materials shall be in accordance with the requirements of Section 211 of the Specifications; and where Stone Matrix Asphalt (SMA) is specified in the Contract, Section 248 of the Specifications; and the Special Provision for Placement of Asphalt Concrete Overlays.

III. EQUIPMENT

Equipment for furnishing and placing asphalt concrete overlay shall be in accordance with the requirements of Section 315 of the Specifications; and where Stone Matrix Asphalt (SMA) is specified in the Contract, Section 317 of the Specifications. Pavement planing equipment shall be in accordance with the requirements of the Special Provision for Cold Planing (Milling) Asphalt Concrete Operations and Section 515 of the Specifications.

IV. PROCEDURES

Furnishing and placing asphalt concrete overlay shall be in accordance with the requirements of Section 315 of the Specifications; and where Stone Matrix Asphalt (SMA) is specified in the Contract, Section 317 of the Specifications. Where pavement planing is required, it shall be in accordance with the requirements of the Special Provision for Cold Planing (Milling) Asphalt Concrete Operations and Section 515 of the Specifications and as specified herein.

The Contractor shall overlay the intersecting paved road from the edge of pavement of the mainline roadway pavement overlay to a point that includes the entire radius of the intersecting paved road in accordance with the attached drawing. This distance from the edge of pavement of the mainline roadway pavement overlay shall not exceed 50 feet measured in accordance with the drawing herein.

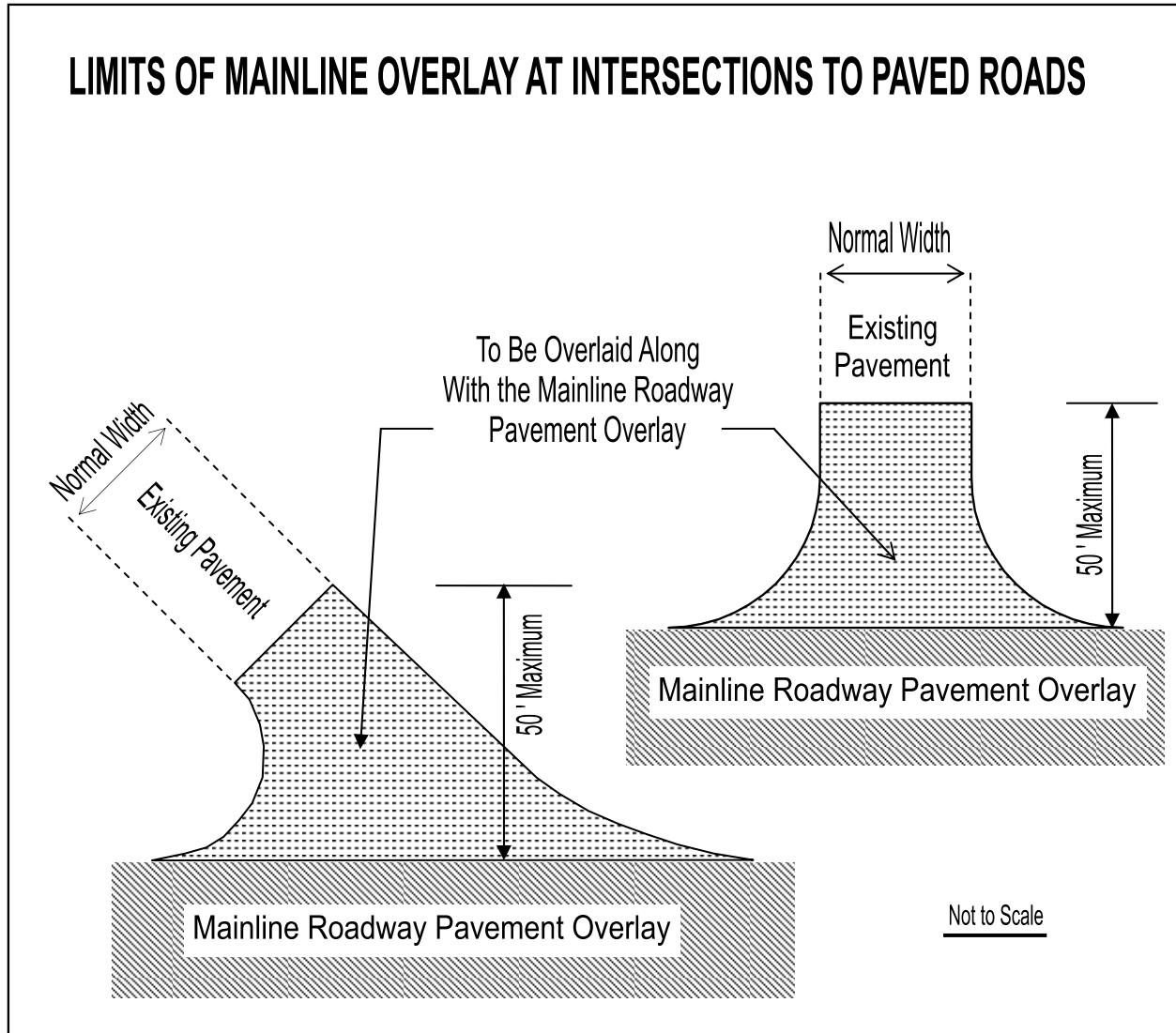
On curb and gutter sections where planing is required for the mainline roadway overlay, planing shall also be required on the intersecting paved road area prior to these areas being overlaid.

Asphalt concrete overlay pavement placed on existing paved roadway surfaces that intersects the mainline roadway pavement overlay shall be constructed using a method approved by the Engineer, which shall include the cutting of a notch into the pavement. The approved method shall provide a smooth transition between new pavement and existing pavement. Such tie-ins shall conform to the requirements of Section 315.05(c) of the Specifications except that all joints at tie-in locations shall be tested using a 10-foot straightedge in accordance with the requirements

of Section 315.07(a) of the Specifications. The variation from the testing edge of the straightedge between any two contact points with the pavement surface shall not exceed 1/4 inch.

V. MEASUREMENT AND PAYMENT

Overlay at intersections to paved roads will be measured and paid for in accordance with the pay items of Section 315 of the Specifications; and where Stone Matrix Asphalt (SMA) is specified in the Contract, Section 317 of the Specifications, and the Special Provision for Cold Planing (Milling) Asphalt Concrete Operations and Section 515 of the Specifications.



VIRGINIA DEPARTMENT OF TRANSPORTATION
2007 ROAD AND BRIDGE SUPPLEMENTAL SPECIFICATIONS

SUPPLEMENTAL SECTION 302—DRAINAGE STRUCTURES

SECTION 302—DRAINAGE STRUCTURES of the Specifications is amended as follows:

Section 302.03(b) Precast Drainage Structures is amended to replace the second paragraph with the following:

Requests for approval of a precast design shall include detailed plans and supporting computations that have been reviewed by a registered Professional Engineer having at least 5 years experience in structural design of precast structures or components proposed and licensed in the Commonwealth. Unless otherwise specified, concrete exposed to freeze/thaw environments shall conform to Section 217.02 of the Specifications and shall have a design strength at 28 days of at least 4,000 pounds per square inch and an air content of 6 ± 2 percent. Concrete not exposed to freeze/thaw environments shall be exempt from the requirements of Section 217.02(a) of the Specifications. The design of the concrete mixture and the method of casting, curing handling and erecting of precast units shall be subject to review by the Engineer. Precast units may be shipped after reaching 85 percent of the design strength as determined by control cylinders. Sampling and testing concrete strength shall be performed using control cylinders in accordance with ASTM C31 and C39 at a rate of one set of cylinders per lot. A lot is defined as a maximum 250 cubic yards or a single weeks production (whichever quantity is less) of precast concrete from each batching operation, being of like material, strength and manufactured by the same process. Variations of lot definition will be governed by applicable specifications and approved by the Engineer. Control cylinders used for acceptance testing shall be cured under the same conditions as the concrete the cylinders represent. Units shall retain their structural integrity during shipment and shall be subject to inspection at the job site. Approval to use precast units shall not be construed as waiving the size and weight limitations specified in Section 107.21 of the Specifications.

Section 302.03(b)2. Precast arches is replaced with the following:

2. **Precast arches** shall conform to the applicable requirements of the current AASHTO's *LRFD Bridge Design Specifications* and VDOT modifications (current VDOT I&IM-S&B-80) and the following modifications:

- a. **Protection against corrosion:** The concrete cover of reinforcement shall be at least 1 1/2 inches.

Reinforcing steel for arches in 0 to 2 foot fills, in corrosive or marine environments, or in other severe exposure conditions shall be corrosion resistant reinforcing steel, Class I. When corrosion resistant reinforcing steel is required, the minimum cover specified shall not be reduced.

Exposed reinforcing bars, inserts, and plates intended for bonding with future extensions shall be protected from corrosion as directed by the Engineer.

Reinforcement shall be designed and detailed in consideration of fabrication and construction tolerances so that the minimum required cover and proper positioning of reinforcement shall be maintained.

- b.—**Anchorage:** Sufficient anchorage shall be provided at the terminus of lines of precast units. Anchorage may consist of a cast-in-place end section at least 3 feet in length with a headwall or collar around the precast unit(s) provided adequate connection can be made between the collar and units.
- c.—**Joints:** Joints between units shall be sealed by preformed plastic or mastic gaskets or grout. When preformed gaskets are used, they shall be of a type listed on the Department's approved products list.
- d. **Pipe openings:** Pipe openings will not be allowed in the precast arch but may be provided through the wingwalls. When required, openings shall conform to the requirements of (b)1.b. herein.

Section 302.03(b)3. Precast box culverts is replaced with the following:

- 3. **Precast box culverts** shall conform to the applicable requirements of the current *AASHTO's LRFD Bridge Design Specifications* and VDOT modifications (current VDOT I&IM-S&B-80) and the following modifications:

- a. Precast Box Culverts shall conform to the applicable material requirements of ASTM C1577. The design shall be a Special Design which need not conform to the reinforcing steel and geometry shown in the design tables and the appendix in ASTM C1577.
- b. For protection against corrosion, the following minimum concrete cover shall be provided for reinforcement: For boxes with more than 2 feet of fill over the top slab: 1 1/2 inches. For boxes with less than 2 feet of fill over the top slab: top reinforcement of top slab: 2 1/2 inches; bottom reinforcement of top slab: 2 inches; all other reinforcement: 1 1/2 inches.

Reinforcing steel for arches in 0 to 2 foot fills, in corrosive or marine environments, or in other severe exposure conditions shall be corrosion resistant reinforcing steel, Class I. When corrosion resistant reinforcing steel is required, the minimum cover specified shall not be reduced.

- c. The type of sealant used in joints between units shall be from the Department's Approved List of Preformed Plastic or Mastic Gaskets.

Where double or greater lines of precast units are used, a buffer zone of 3 to 6 inches between lines shall be provided. This buffer zone shall be backfilled with porous backfill conforming to the requirements of Section 204. The porous backfill shall be drained by a 3-inch-diameter weep hole, formed by non-rigid tubing, located at the top of the bottom haunch, centered in the outlet end section and at approximately 50-foot intervals along the length of the box. Weep holes shall be covered with a 3-foot-square section of filter barrier cloth firmly attached to the outside of the box. A 3-foot width of filter barrier cloth shall also be centered over the buffer zone for the entire length of the structure after placement of the porous backfill material. Filter barrier cloth shall conform to the requirements of Section 245.

Forming weep holes and furnishing and placing of the filter barrier cloth shall be included in the price bid per linear foot for the precast box culvert.

- d. At the terminus of precast units, sufficient anchorage shall be provided. This anchorage may consist of a cast-in-place end section at least 3 feet in length with a headwall and curtain wall or a collar cast-in-place around the units provided adequate connection can be made between the collar and units.

When the ends of precast units are skewed, the end section shall be cast monolithically. The skew may be provided by forming, saw cutting, or other methods approved by the Engineer.

Regardless of the method used, the variation in the precast unit from the exact skew shall be not greater than 1 1/2 inches at any point.

- e. Pipe openings shall conform to the requirements of 1.b. herein.
- f. Bedding and backfill shall be in accordance with Standard PB-1 for box culverts.

Section 302.03 Procedures is amended to add the following

(d) Post Installation Inspection

In addition to the visual inspection performed by the Department during the initial installation of storm sewer pipes and pipe culverts, a post installation visual/video camera inspection shall be conducted by the Contractor in accordance with the requirements of this specification and VTM 123 on all storm sewer pipe and a selected number of pipe culverts. For the purposes of this Section, a storm sewer pipe is defined as either a component of a storm sewer system as defined in Section 101.02 of the Specifications or any pipe identified on the plans as storm sewer pipe. All other pipe shall be considered pipe culverts. Post installation Inspections shall be performed on straight line and radial installations.

For pipe culverts, a minimum of one pipe installation for each size of each material type utilized on the project will be randomly selected by the Engineer for inspection, however, in no case will the amount of pipe subject to inspection be less than ten percent of the total contract amount for the size and material type indicated. Where possible, for all installations in which the pipe or culvert's size, orientation, or location permit deflection to be easily visually identified, (as verified with the Engineer) the Contractor may perform visual inspections in lieu of video inspections. If defects as described herein are noted during the inspection, the Engineer may require additional pipe installations of that size and/or material be inspected. The Contractor shall coordinate and schedule all post installation inspections so that these are made in the presence of the Engineer. The post installation inspection shall be performed no sooner than 30 days after completion of the pipe installation and placement of final cover (except for pavement structure). The Contractor shall issue a report detailing all issues or deficiencies noted during the inspection (including a remediation plan for each deficiency noted where applicable) no later than 5 days after completion of the inspection.

While the intent of this requirement is to perform the post installation inspection prior to paving, project scheduling may dictate that a particular site be paved before the end of the 30 day period. In such cases, a preliminary inspection of the pipe shall be made, prior to paving over it, to insure that the pipe has been properly installed and is performing well. Performing such a preliminary inspection prior to paving will not relieve the Contractor from the requirement to perform the post installation inspection after the 30 day period.

The Contractor's inspection report shall identify and address any of the following items observed during the post installation inspection including identifying any proposed remediation measures the Contractor plans to perform where applicable. Remediation measures may consist of repairing or replacing the defective pipe section(s) or a combination of the two where differing conditions exist within the same run of pipe. Where permitted as an option, remediation methods for the various installation defects shall be proposed by the Contractor, reviewed with the Engineer and must have the Engineer's approval prior to implementation of the corrective action. Remediation shall be the sole responsibility of the Contractor. Further, if remediation measures are shown to be necessary, any time associated with such measures shall be reflected in the impact to the Contractor's progress schedule (may take the form of a time impact analysis,

where required by the scheduling requirements) and will not relieve the Contractor of his responsibilities to finish the work required by the contract within the contract time limits or form the basis for any claim of delay where such remediation measures are determined to be a result of the Contractor's fault, omission or negligence.

Upon completion of any corrective remedial measures, the corrected installations are to be re-inspected prior to final acceptance of the project utilizing the test methods identified in VTM 123.

The following criteria shall form the basis for inspections for the respective pipe or culvert types listed:

1. **Concrete Pipe\Culverts:**

- a. **Misalignment:** Vertical and horizontal alignment of the pipe culvert or storm drain pipe barrel shall be checked by sighting along the crown, invert and sides of the pipe, and by checking for sagging, faulting and invert heaving. For the purposes of this provision faulting is defined as differential settlement between joints of the pipe, creating a non-uniform profile of the pipe. The person assigned by the Contractor to perform the inspection should take into account pipe or culvert laid with a designed camber or grade change in accordance with project or site requirements. Horizontal alignment shall be checked for straightness or smooth curvature. Any issues involving incorrect horizontal and/or vertical alignment shall be noted in the inspection report. If any vertical and/or horizontal misalignment problems are visually noted by the Engineer or in the inspection report, a further evaluation shall be conducted by the Engineer to determine the impact of the misalignment on the joints and wall of the pipe to ascertain what corrective actions are needed. All corrective actions determined necessary by the Engineer that are a result of the Contractor's negligence, omission or fault shall be the sole responsibility of the Contractor to remedy.

- b. **Joints:** Leaking joints may be detected during low flows by visual observation of the joints or checking around the ends of pipes or culverts for evidence of piping or seepage.

Differential movement, cracks, spalling, improper gasket placement, movement or settlement of pipe\culvert sections, and leakage shall be noted by the Contractor in the report. Joint separation greater than one inch shall be remediated by the Contractor at his expense to the satisfaction of the Engineer. Evidence of soil migration through the joint will be further evaluated by the Engineer to determine the level of corrective action necessary. All corrective actions determined necessary by the Engineer that are a result of the Contractor's negligence, omission or fault shall be the sole responsibility of the Contractor to remedy.

- c. **Cracks:** Longitudinal cracks with a width less than one hundredth of an inch (0.01) are considered hairline and minor. They shall be noted in the inspection report; however, no remedial action is necessary.

Longitudinal cracks having a width equal to or greater than one hundredth of an inch (0.01) but equal to or less than one tenth of an inch (0.1) and determined by the Engineer to be detrimental to the structure shall be sealed by a method proposed by the pipe\culvert manufacturer and approved by the Engineer. Pipes or culverts having longitudinal

cracks with widths greater than one tenth of an inch (0.1) and determined to be beyond the limits of a satisfactory structural repair shall be replaced by the Contractor at his expense to the satisfaction of the Engineer.

Pipes or culverts having displacement across the crack greater than 0.1 inch but less than 0.3 inch shall be remediated. Remediation methods shall be in accordance with recommendations of the pipe or culvert manufacturer, be acceptable to and authorized by the Engineer before implementation and shall be the sole responsibility of the Contractor. Pipes\culverts having displacement across the crack greater than 0.3 inch shall be replaced by the Contractor at his expense to the satisfaction of the Engineer.

Transverse cracks will be evaluated using the same criteria as indicated above for longitudinal cracks.

- d. **Spalls:** Spalling is defined as a localized pop-out of concrete along the wall of the pipe\culvert generally caused by corrosion of the steel reinforcement or at the edges of longitudinal or circumferential cracks. Spalling may be detected by visual examination of the concrete along the edges of the crack. The person conducting the inspection shall check for possible delamination. If delamination is noted or if a hollow sound is produced when the area is tapped with a device such as a hammer, the pipe\culvert shall be remediated. Remediation methods shall be in accordance with recommendations of the pipe\culvert manufacturer, be acceptable to and authorized by the Engineer before proceeding, and shall be the sole responsibility of the Contractor.
- e. **Slabbing:** Any pipe\culvert experiencing slabbing shall be remediated. Slabbing is a structural failure of the pipe\culvert that results from radial or diagonal tension forces in the pipe\culvert. These failures appear as a separation of the concrete from the reinforcing steel near the crown or invert of the pipe\culvert and may span the entire length of a pipe or culvert section (joint to joint). Remediation methods shall be in accordance with recommendations of the pipe or culvert manufacturer, be acceptable to and authorized by the Engineer before proceeding, and shall be the sole responsibility of the Contractor. Where slabbing is of such magnitude that, in the opinion of the Engineer the integrity or service life of the pipe or culvert is severely compromised, the section(s) of pipe or culvert exhibiting such deficiency shall be replaced at the Contractor's expense to the satisfaction of the Engineer.

2. Thermoplastic Pipe\Culvert:

- a. **Misalignment:** Vertical and horizontal alignment of the pipe culvert or storm drain pipe barrel(s) shall be checked by sighting along the crown, invert and sides of the pipe, and by checking for sagging, faulting and invert heaving. The person assigned by the Contractor to perform the inspection should take into account pipes\culverts laid with a designed camber or grade change. Horizontal alignment shall be checked for straightness or smooth curvature. Any issues with horizontal and/or vertical alignment shall be noted in the inspection report. If any vertical and/or horizontal misalignment problems are noted in the inspection, a further evaluation will be performed by the Engineer to determine the impact of the misalignment on the joints and wall of the pipe\culvert to ascertain what corrective actions are needed. All corrective actions

determined necessary by the Engineer that are a result of the Contractor's negligence, omission or fault shall be the sole responsibility of the Contractor to remedy.

- b. **Cracks:** Cracks or splits in the interior wall of the pipe shall be remediated. Remediation methods shall be in accordance with recommendations of the pipe manufacturer, be acceptable to and authorized by the Engineer before proceeding, and shall be the sole responsibility of the Contractor
- c. **Joints:** Pipes\culverts showing evidence of crushing at the joints shall be remediated. Differential movement, improper joint sealing, movement or settlement of pipe\culvert sections, and leakage shall be noted in the inspection report. Joint separation of greater than 1 inch shall be remediated. Evidence of soil migration through the joint will be further investigated by the Engineer to determine the level of remedial action required by the Contractor. Remediation methods shall be in accordance with recommendations of the pipe manufacturer, be acceptable to and authorized by the Engineer before proceeding. All corrective actions determined necessary by the Engineer that are a result of the Contractor's negligence, omission or fault shall be the sole responsibility of the Contractor to remedy.
- d. **Buckling, bulging, and racking:** Flat spots or dents at the crown, sides or flow line of the pipe due to racking shall be noted in the inspection report and will be evaluated by the Engineer. Areas of wall buckling and bulging shall also be noted in the inspection report and evaluated by the Engineer for corrective action if deemed necessary by the Engineer. All corrective actions determined necessary by the Engineer shall be the sole responsibility of the Contractor.
- e. **Deflection:** Any one of several methods may be used to measure deflection of thermoplastic pipe\culvert (laser profiler, mandrel, direct manual measure, etc.) If the initial inspection indicates the pipe\culvert has deflected 7.5 percent or more of its original diameter, and if the original inspection was performed using a video camera, then a mandrel test shall also be performed in accordance with VTM 123. All deflections shall be noted in the inspection report. Deflections of less than 5 percent of the original pipe\culvert's diameter shall not require remediation. Deflection of 5 percent up to 7.4 percent will be evaluated by the Engineer. If the pipe\culvert experiences additional defects along with deflection of 5 percent up to 7.4 percent of the original pipe\culvert's diameter, the pipe\culvert shall be remediated. Remediation methods shall be in accordance with recommendations of the pipe\culvert manufacturer, be acceptable to and authorized by the Engineer before proceeding, and shall be the sole responsibility of the Contractor.

If the pipe\culvert is deflected 7.5 percent or greater of the original diameter, the pipe\culvert shall be replaced by the Contractor at his expense to the satisfaction of the Engineer

In lieu of the options noted above for remediation of deflection in thermoplastic pipe\culvert installations, the Contractor may elect to follow the payment schedule below:

Amount of Deflection	Percent of Payment
0.0 % TO 5.0%	100% of Unit Bid Price
5.1% to 7.5%	75% of Unit Bid Price
Greater than 7.5%	Remove and Replace at Contractor's Expense

Remediation efforts and payment shall apply to the entire section(s) of the deflected pipe or culvert, joint to joint.

3. **Metal Pipe\Culvert:**

- a. **Misalignment:** Vertical and horizontal alignment of the pipe culvert or storm drain pipe barrel shall be checked by sighting along the crown, invert and sides of the pipe\culvert, and by checking for sagging, faulting and invert heaving. The person assigned by the Contractor to perform the inspection should take into account pipe laid with a designed camber or grade change. Horizontal alignment shall be checked for straightness or smooth curvature. Any issues with horizontal and/or vertical alignment shall be noted in the inspection report for evaluation by the Engineer. If any vertical and/or horizontal misalignment problems are noted in the inspection, further evaluation will be conducted by the Engineer to determine the impact of the misalignment on the joints and wall of the pipe\culvert to ascertain what corrective actions by the Contractor are needed. All corrective actions determined necessary by the Engineer that are a result of the Contractor's negligence, omission or fault shall be the sole responsibility of the Contractor to remedy.
- b. **Buckling, bulging, and racking:** Flat spots or dents at the crown, sides or flow line of the pipe due to racking shall be noted by the Contractor's inspector in the inspection report and will be evaluated by the Engineer for possible remediation by the Contractor. Areas of wall buckling and bulging shall also be noted in the inspection report and evaluated by the Engineer for possible remediation by the Contractor. If the Engineer determines corrective actions are necessary they shall be in accordance with the pipe\culvert manufacturer's recommendations, be acceptable to and authorized by the Engineer prior to implementation and be the sole responsibility of the Contractor.
- c. **Joints: Pipes showing evidence of** crushing at the joints shall be remediated. Differential movement, improper joint sealing, movement or settlement of pipe sections, and leakage shall be noted in the report. Joint separation of greater than 1.0 inch shall be remediated. Evidence of soil migration through the joint will be further investigated by the Engineer to determine the level of remedial action required by the Contractor. All corrective actions determined necessary by the Engineer that are a result of the Contractor's negligence, omission or fault shall be the sole responsibility of the Contractor to remedy.
- d. **Coating:** Areas of the pipe where the original coating has been scratched, scoured or peeled shall be noted in the inspection report and evaluated by the Engineer to determine the need for immediate repair. If repairs are required they shall be performed by and at the expense of the Contractor in accordance with the recommendations of the pipe\culvert coating manufacturer.

- e. **Deflection:** Any one of several methods may be used to measure deflection of metal pipe\culvert (laser profiler, mandrel, direct manual measure, etc.) If the initial inspection indicates the pipe\culvert has deflected 7.5 percent or more of its original diameter, and if the original inspection was performed using a video camera, then a mandrel test shall also be performed in accordance with VTM 123. All deflections shall be noted in the inspection report. Deflections of less than 5 percent of the original pipe\culvert's diameter shall not require remediation. Deflection of 5 percent up to 7.4 percent will be evaluated by the Engineer. If the pipe\culvert experiences additional defects along with deflection of 5 percent up to 7.4 percent of the original pipe\culvert's diameter, the pipe\culvert shall be remediated. Remediation methods shall be in accordance with recommendations of the pipe\culvert manufacturer, be acceptable to and authorized by the Engineer before proceeding, and shall be the sole responsibility of the Contractor.

If the pipe\culvert is deflected 7.5 percent or greater of the original diameter, the pipe shall be replaced by the Contractor at his expense to the satisfaction of the Engineer

In lieu of the options noted above for remediation of metal pipe\CULVERT, the Contractor may elect to follow the payment schedule below:

Amount of Deflection	Percent of Payment
0.0 % TO 5.0%	100% of Unit Bid Price
5.1% to 7.5%	75% of Unit Bid Price
Greater than 7.5%	Remove and Replace at Contractors Expense

Remediation efforts and percentage of payment shall apply to the entire section(s) of the deflected pipe or culvert, joint to joint.

Section 302.04 Measurement and Payment is amended to add the following:

Post installation inspection shall be measured and paid for at the contract unit price per linear foot. This price shall include performing visual and video camera inspection(s), preparing and furnishing documentation to include narratives and video media in accordance with the requirements herein and VTM 123.

The cost of the remedial measures (including removal and replacement of the pipe, if necessary) and the re-inspection of the remediated pipe necessitated as a result of the Contractor's negligence, omission or fault shall be the contractual and financial responsibility of the Contractor.

Payment will be made under:

Pay Item	Pay Unit
Post installation inspection	Linear Foot

Section 302.04 Measurement and Payment is amended to add the following:

Epoxy-coated reinforcing steel, when a pay item, will be measured in pounds of uncoated steel and will be paid for at the contract unit price per pound. The weight will be computed from the theoretical weights of the nominal sizes of steel specified and placed in the structure. Measurement will not be made for epoxy-coating material. This price shall include furnishing steel and epoxy-

coating material; applying coating material; fabricating, shipping, and placing epoxy-coated reinforcement in the structure; and necessary repairing of epoxy coatings.

Payment will be made under:

Pay Item

Pay Unit

Epoxy-coated reinforcing steel

Pound

VIRGINIA DEPARTMENT OF TRANSPORTATION
2007 ROAD AND BRIDGE SUPPLEMENTAL SPECIFICATIONS

SUPPLEMENTAL SECTION 303—EARTHWORK

SECTION 303—EARTHWORK of the Specifications is amended as follows:

Section 303.02—Materials is amended to add the following:

- (e) **Seed** shall conform to Section 244.02(c) of the Specifications.

Section 303.03—Erosion and Siltation Control is amended to replace the second paragraph the following:

Erosion and siltation control devices and measures shall be maintained in a functional condition at all times. Temporary and permanent erosion and siltation control measures shall be inspected in accordance with the requirements of Section 107.16(a) of the Specifications. Deficiencies shall be immediately corrected. The Contractor shall make a daily review of the location of silt fences and filter barriers to ensure that they are properly located for effectiveness. Where deficiencies exist, corrections shall be made immediately as approved or directed by the Engineer.

Section 303.03(b) Soil Stabilization is amended to replace the last paragraph with the following:

Areas that cannot be seeded because of seasonal or adverse weather conditions shall be mulched to provide some protection against erosion to the soil surface. Mulch shall be applied in accordance with the requirements of Section 603.03(e) of the Specifications and paid for in accordance with the requirements of Section 603.04 of the Specifications. Organic mulch shall be used, and the area then seeded as soon as weather or seasonal conditions permit in accordance with the requirements of Section 603.03 of the Specifications. Organic mulch includes: straw or hay, fiber mulch, wood cellulose, or wood chips conforming to the requirements of Section 244.02(g) of the Specifications.

Section 303.03(f) Sediment Traps and Sediment Basins is replaced with the following:

- (f) **Sediment Traps and Sediment Basins:** Sediment traps shall be utilized where the storm water runoff from disturbed areas is comprised of flow from a total drainage area of less than 3 acres. Sediment basins shall be utilized where the storm water runoff from disturbed areas is comprised of flow from a total drainage area of 3 or more acres. Once a sediment trap or basin is constructed, the dam and all outfall areas shall be stabilized immediately.

Section 303.03—Erosion and Siltation Control is amended to add the following:

- (h) **Temporary Diversion Dike:** This work shall consist of constructing temporary diversion dikes at the locations designated on the plans and in accordance with the plan details and the Specifications, stabilizing with seed and mulch, maintaining, removing when no longer required, and restoration of the area.

Temporary diversion dikes shall be installed as a first step in land-disturbing activities and shall be functional prior to upslope land disturbance. The dike shall be constructed to prevent failure in accordance with Section 303.04 of the Specifications. Seeding and mulch shall be applied to the dike in accordance with Section 603 of the Specifications immediately following its construction. The dikes should be located to minimize damages by construction operations and traffic.

The Contractor shall inspect the temporary diversion dikes after every storm and repairs made to the dike, flow channel, outlet, or sediment trapping facility, as necessary. Once every two weeks, whether a storm event has occurred or not, the measure shall be inspected and repairs made if needed. Damages to the dikes caused by construction traffic or other activity must be repaired before the end of the working day.

Section 303.06(e)—Erosion Control Items is amended to replace “4. **Check dams**” with the following:

4. **Check dams** will be paid for at the contract unit price per each. This price shall include furnishing, excavating, constructing, maintaining, repositioning as may be required during construction and removing the check dams if, or when, no longer required.

Synthetic check dams may be substituted for Type II Rock Check dams (Standard EC-4) at no additional cost to the Department.

Section 303.06(e)—Erosion Control Items is amended to replace “6. **Geotextile fabric**” with the following:

6. **Geotextile fabric** attached to brush barriers or existing fence or used for another function specified on the plans will be measured in square yards, complete-in-place, excluding laps, and will be paid for at the contract unit price per square yard. This price shall include trimming the brush barrier; furnishing, installing, maintaining, and removing the fabric; and dressing and stabilizing the area.

The brush barrier will not be measured for separate payment. The cost thereof shall be included in the price for clearing and grubbing.

Section 303.06(e)—Erosion Control Items is amended to replace “15. **Drop Inlet Silt Trap**” and its corresponding Pay Item and Pay Unit with the following:

15. Inlet protection:

- a. **Inlet Protection Type A** will be measured in units of each and will be paid for at the contract unit price per each location shown or specified. The price shall include furnishing and installing temporary filter barrier including posts and top rails, coarse aggregate and, if required, sediment forebay. This price shall also include maintenance and removal until no longer required. Inlet Protection Type A will be paid for only one time during the duration of the project.
- b. **Inlet Protection Type B** will be measured in units of each and will be paid for at the contract unit price per each location shown or specified. The price shall include furnishing and installing hardware mesh cloth, concrete blocks, wooden studs, coarse aggregate, and maintenance and removal until no longer required. Inlet Protection Type B will be paid for only one time during the duration of the project.
- c. **Inlet Protection Type C** will be measured and paid for in accordance with the individual pay items and pay units shown in the Standard Drawing for EC-6, Type C. The individual pay items for Inlet Protection Type C will be paid for only one time during the duration of the project for each location shown or specified

Payment will be made under:

Pay Item

Pay Unit

Inlet protection Type A	Each
Inlet protection Type B	Each

Section 303.06(e)—Erosion Control Items is amended to add the following:

18. **Temporary diversion dike** will be measured in linear feet, complete-in-place, and will be paid for at the contract unit price per linear foot. This price shall be full compensation for installing the diversion dike, stabilizing with seed and mulch, maintaining, removing when no longer required, and restoration of the area.

Payment will be made under:

Pay Item	Pay Unit
Temporary diversion dike	Linear foot

VIRGINIA DEPARTMENT OF TRANSPORTATION
2007 ROAD AND BRIDGE SUPPLEMENTAL SPECIFICATIONS

SUPPLEMENTAL SECTION 315—ASPHALT CONCRETE PLACEMENT

SECTION 315—ASPHALT CONCRETE PAVEMENT of the Specifications is amended as follows:

The Table of Contents for the 2007 Road and Bridge Specifications is revised to rename **SECTION 315—ASPHALT CONCRETE PAVEMENT** as **SECTION 315—ASPHALT CONCRETE PLACEMENT**.

Section 315.01—Description is replaced with the following:

This work shall consist of constructing one or more courses of asphalt concrete on a prepared foundation in accordance with the requirements of these specifications and within the specified tolerances for the lines, grades, thicknesses, and cross sections shown on the plans or as established by the Engineer. At the Contractor's option, the asphalt concrete mix may be produced using a warm-mix additive or process approved by the Department. When used, the temperature placement limitations for Warm Mix Asphalt (WMA) shall be applied.

Section 315.02(b) Asphalt for tack coat and prime coat is replaced with the following:

Asphalt for Tack Coat shall conform to the special provision titled "Nontracking Tack Coat." Asphalt for Prime Coat shall conform to the requirements in Section 310 of the Specifications. Asphalt for prime coat may be changed by one viscosity grade by the Engineer at no change in the contract unit price.

Section 315.02(d) Liquid asphalt coating (emulsion) for rumble strip is replaced with the following:

- (d) **Liquid asphalt coating (emulsion) for rumble strip** shall conform to the requirements of Section 210 of the Specifications. For centerline rumble strips, CSS-1h or CQS-1h conforming to Section 210 of the Specifications shall be used. The CSS-1h or CQS-1h may be diluted by up to 30 percent at the emulsion manufacture's facility.

Section 315.03(a) Hauling Equipment is replaced with the following:

- (a) **Hauling Equipment:** Trucks used for hauling asphalt mixtures shall have tight, clean, smooth metal or other non-absorptive/inert material bodies equipped with a positive locking metal tailgate. Surfaces in contact with asphalt mixtures shall be given a thin coat of aliphatic hydrocarbon invert emulsion release agent (nonpuddling), a lime solution, or other material on the Department's list of approved release agents. Except where a nonpuddling release agent is used, the beds of dump trucks shall be raised to remove excess agent prior to loading. Only a nonpuddling agent shall be used in truck beds that do not dump. Each truck shall be equipped with a tarpaulin or other cover that will protect the mixture from moisture and foreign matter and prevent the rapid loss of heat during transportation.

Section 315.03—Equipment is amended by adding the following:

- (e) **Material Transfer Vehicle (MTV):** When required in the Contract, a MTV shall be a self-propelled storage unit capable of receiving material from trucks, storing the material and transferring the material from the unit to a paver hopper insert via a conveyor system. The required paver hopper insert and unit shall have a combined minimum storage

capacity of 15 tons. Prior to placing the asphalt material on the roadway surface, the storage unit or paver hopper insert must be able to remix the material in order to produce a uniform, non-segregated mix, having a uniform temperature.

Section 315.04—Placement Limitations is replaced with the following:

Asphalt concrete mixtures shall not be placed when weather or surface conditions are such that the material cannot be properly handled, finished, or compacted. The surface upon which asphalt mixtures are to be placed shall be free of standing water, dirt, and mud and the base temperature shall conform to the following:

(a) **Asphalt Concrete Produced with Warm Mix Asphalt Additives or Processes:**

1. **When the base temperature is 40 degrees F and above**, laydown will be permitted at any temperature below the maximum limits given in Section 211.08 of the Specifications.
2. **When the laydown temperature is between 301 degrees F and 325 degrees F**, the number of compaction rollers will be the same number as required for 300 degrees F or less.

(b) **Asphalt Concrete Produced without Warm Mix Asphalt Additives or Processes:**

1. **When the base temperature is above 80 degrees F**, mixture laydown will be permitted at any temperature conforming to the limits specified in Section 211 of the Specifications.
2. **When the base temperature is between 40 degrees F and 80 degrees F**, the Nomograph, Table III-2, shall be used to determine the minimum laydown temperature of the asphalt concrete mixes. At no time should the minimum base temperature for base (BM) and intermediate (IM) mixes be less than 40 degrees F. At no time should the minimum laydown temperature for base (BM) and intermediate (IM) mixes be less than 250 degrees F.

For surface mixes (SM), at no time should the minimum base and laydown temperatures be less than the following:

PG Binder/Mix Designation	Percentage of Reclaimed Asphalt Pavement (RAP) Added to Mix	Minimum Base Temperature	Minimum Placement Temperature
PG 64-22 (A)	<=25%	40 °F	250 °F
PG 64-22 (A)	>25%	50 °F	270 °F
PG 70-22 (D)	<=30%	50 °F	270 °F
PG 76-22 (E)	<=15%	50 °F	290 °F
PG 64-22 (S)	<=30%	50 °F	290 °F

- (3) **When the laydown temperature is between 301 degrees F and 325 degrees F**, the number of compaction rollers will be the same number as required for 300 degrees F.

Intermediate and base courses that are placed at rates of application that exceed the application rates shown in Table III-2 shall conform to the requirements for the maximum application rate shown for 8-minute and 15-minute compaction rolling as per number of rollers used.

Should the Contractor be unable to complete the compaction rolling within the applicable 8-minute or 15-minute period, the placing of asphalt mixture shall either cease until sufficient rollers are used or other corrective action is taken to complete the compaction rolling within the specified period.

Compaction rolling shall be completed prior to the mat cooling down to 175 degrees F. Finish rolling may be performed at a lower mat temperature.

The final asphalt pavement finish course shall not be placed until construction pavement markings are no longer required.

Section 315.05(b) Conditioning Existing Surface is replaced with the following:

- (b) **Conditioning Existing Surface:** When the surface of the existing pavement or base is irregular, it shall be brought to a uniform grade and cross section as directed by the Engineer. The surface on which the asphalt concrete is to be applied shall be prepared in accordance with the requirements of the applicable specifications and shall be graded and compacted to the required profile and cross section.

When specified, prior to placement of asphalt concrete, longitudinal and transverse joints and cracks shall be sealed by the application of an approved crack sealing material per special provision titled "Sealing Cracks in Asphalt Concrete Surfaces or Hydraulic Cement Concrete Pavement".

Contact surfaces of curbing, gutters, manholes, and other structures projecting into or abutting the pavement and cold joints of asphalt shall be painted with a thick, uniform coating of asphalt prior to placement of asphalt mixture.

A tack or prime coat of asphalt will be required as specified below and shall conform to the applicable requirements of Section 311 of the Specifications or the special provision titled "Nontracking Tack Coat". Asphalt classed as cutbacks or emulsions shall be applied ahead of the paving operations, and the time interval between applying and placing the paving mixture shall be sufficient to ensure a tacky residue providing maximum adhesion of the paving mixture to the base. The mixture shall not be placed on tack or prime coats that have been damaged by traffic or contaminated by foreign material. Traffic shall be excluded from such sections.

1. **Priming and Tacking:**

- a. **Priming aggregate base or subbase:** Unless otherwise specified in the contract documents, priming with asphalt material will not be required on aggregate subbase or base material prior to the placement of asphalt base, intermediate or surface layers.
- b. **Tacking:** Application of tack at joints, adjacent to curbs, gutters, or other appurtenances, shall be applied with a hand wand or with spray bar at the rate of 0.2 gallon per square yard. At joints, the tack applied by the hand wand or a spray bar shall be 2 feet in width with 4 to 6 inches protruding beyond the joint for the first pass. Tack for the adjacent pass shall completely cover the vertical face of the mat edge, so that slight puddling of asphalt occurs at the joint, and extend a minimum of 1 foot into the lane to be paved.

Milled faces that are to remain in place shall be tacked in the same way for the adjacent pass. Use of tack at the vertical faces of longitudinal joints will not be required when paving in echelon.

On rich sections or those that have been repaired by the extensive use of asphalt patching mixtures, the tack coat shall be eliminated when directed by the Engineer.

Tack shall not be required atop asphalt stabilized open-graded material drainage layers.

Tack shall be applied between the existing asphalt surface and each asphalt course placed thereafter.

2. **Removing depressions and elevating curves:** Where irregularities in the existing surface will result in a course more than 3 inches in thickness after compaction, the surface shall be brought to a uniform profile by patching with asphalt concrete and thoroughly tamping or rolling until it conforms with the surrounding surface. The mixture used shall be the same as that specified for the course to be placed.

When the Contractor elects to conduct operations to eliminate depressions, elevate curves, and place the surface course simultaneously, he shall furnish such additional spreading and compacting equipment as required to maintain the proper interval between the operations.

Section 315.05(c) Placing and Finishing is amended to replace the second paragraph with the following:

A continuous line to mark the edge of pavement and provide proper control of pavement width and horizontal alignment will not be required for this contract.

And to add the following paragraphs:

Prior to application of tack coat and commencement of paving operations the Contractor shall clean the existing pavement surface of all accumulated dust, mud, or other debris that may affect the bond of the new overlay, as determined by the Engineer. The Contractor shall ensure the surface remains clean until commencement and during paving operations. The cost for cleaning and surface preparation shall be included in the bid price for asphalt concrete.

When required in the Contract, a MTV shall be used during the placement of designated asphalt mixes on full lane width applications.

Section 315.05(c) Placing and Finishing is amended to replace the fifth paragraph with the following:

The Contractor shall have a certified Asphalt Field Level II Technician present during all paving operations. Immediately after placement and screeding, the surface and edges of each layer shall be inspected by the Asphalt Field Level II Technician to ensure compliance with the asphalt placement requirements and straightedged to ensure uniformity and smoothness. The Asphalt Field Level II Technician shall make necessary corrections, if necessary, prior to compaction. The finished pavement shall be uniform and smooth.

The Contractor's Asphalt Field Level II Technician shall be present during all density testing.

Section 315.05(d) Compacting is amended by replacing the fifth paragraph with the following:

Rolling shall begin at the sides and proceed longitudinally parallel with the center of the pavement, each trip overlapping at least 6 inches, gradually progressing to the crown of the pavement. When abutting a previously placed lane, rolling shall begin at the outside unconfined

side and proceed toward the previously placed lane. On superelevated curves, rolling shall begin at the low side and proceed to the high side by overlapping of longitudinal trips parallel with the centerline.

Section 315.05(e) is replaced with the following:

(e) **Density:** Density shall be determined in accordance with the following:

1. The Contractor shall perform roller pattern and control strip density testing on surface, intermediate, and base courses in accordance with the requirements of VTM-76. The Contractor shall have a certified Asphalt Field Technician perform all density testing.

Density shall be determined with a thin-lift nuclear gauge conforming to the requirements of VTM-81 or from the testing of plugs/cores taken from the roadway where the mixture was placed. Density test locations shall be marked and labeled in accordance with the requirements of VTM-76. When acceptance testing is performed with a nuclear gauge, the Contractor shall have had the gauge calibrated within the previous 12 months by approved calibration service. In addition, the Contractor shall maintain documentation of such calibration service for the 12-month period from the date of the calibration service. The required density of the compacted course shall not be less than 98.0 percent and not more than 102.0 percent of the target control strip density.

Nuclear density roller pattern and control strip density testing shall be performed on asphalt concrete overlays placed directly on surface treatment roadways and when overlays are placed at an application rate less than 125 pounds per square yard, based on 110 pounds per square yard per inch, on any surface. In these situations, sawed plugs or core samples will not be required and the minimum control strip densities as specified in Table III-3 will be waived. The required density of the compacted course shall be not less than 98.0 percent and not more than 102.0 percent of the target control strip.

**TABLE III-3
Density Requirements**

Mixture Type	Min. Control Strip Density (%) ¹
SM-9.5A, 12.5A	92.5
SM-9.5D, 12.5D	92.2
SM-9.5E, 12.5E	92.2
IM-19.0A, IM-19.0D, IM-19.0E	92.2
BM-25.0A, BM-25.0D	92.2

¹The control strip density requirement is the percentage of the theoretical maximum density of the job-mix formula by SUPERPAVE mix design or as established by the Engineer based on two or more production maximum theoretical density tests.

The project will be divided into "control strips" and "test sections" by the Engineer for the purpose of defining areas represented by each series of tests.

- a. Control Strip: Control strips shall be constructed in accordance with the requirements of these specifications and VTM-76.

The term *control strip density* is defined as the average of 10 determinations selected at stratified random locations within the control strip.

One control strip shall be constructed at the beginning of work on each roadway and shoulder course and on each lift of each course. An additional control strip shall be constructed when a change is made in the type or source of materials; whenever a significant change occurs in the composition of the material being placed from the same source; or when there is a failing test strip. During the evaluation of the initial control strip, paving operations may continue. However, paving and production shall be discontinued during construction and evaluation of additional control strips. In the event that two consecutive control strips fail, subsequent paving operations shall cease until corrective action(s) has been taken with the approval of the Engineer. If it is determined with the Engineer's approval that the density cannot be obtained because of the condition of the existing pavement structure, the target control strip density shall be determined from the roller pattern that achieves the optimum density and shall be used on the remainder of the roadway that exhibits similar pavement conditions.

Either the Engineer or Contractor may initiate an additional control strip at any time.

The length of the control strip shall be approximately 300 feet and the width shall not be less than 6 feet. On the first day of construction or beginning of a new course, the control strip shall be started between 500 and 1,000 feet from the beginning of the paving operation. The control strip shall be constructed using the same paving, rolling equipment, procedures, and thickness as shall be used on the remainder of the course being placed.

One reading shall be taken at each of 10 stratified random locations. No determination shall be made within 12 inches of the edge of any application width for surface and intermediate mixes or within 18 inches of the edge of any application width for base mixes. The average of these 10 determinations shall be the control strip density recorded to the nearest 0.1 pound per cubic foot. The minimum control strip density shall be determined in accordance with the requirements of VTM-76.

The control strip shall be considered a lot. If the control strip density conforms to the requirements specified in Table III-3, the control strip will be acceptable and the control strip density shall become the target control strip density. If the density does not conform to the requirements specified in Table III-3, the tonnage placed in the control strip and any subsequent paving prior to construction of another control strip will be paid for in accordance with Table III-4 on the basis of the percentage of the Table III-3 value achieved. The Contractor shall take corrective action(s) to comply with the density requirement specified in Table III-3.

TABLE III-4
Payment Schedule for Lot Densities

% of Target Control Strip Density	% of Payment
Greater than 102.0	95
98.0 to 102.0	100
97.0 to less than 98.0	95
96.0 to less than 97.0	90
Less than 96.0	75

- b. **Test section (lot):** For the purposes of acceptance, each day's production shall be considered a lot unless the paving length is less than 3,000 linear feet or greater than 7,500 linear feet. When paving is less than 3,000 feet, it shall be combined with the previous day's production or added to the next day's production to create a lot as described below.

The standard size of a lot shall be 5,000 linear feet, with 1,000 foot sublots, of any pass 6 feet or greater made by the paving train for the thickness of the course. Upon approval by the Engineer, the lot size may be increased to 7,500 linear foot lots with 1,500 foot sublots when the normal daily production is in excess of 7,000 feet. Pavers traveling in echelon will be considered as two passes. When a partial lot occurs at the end of a day's production or upon completion of the project, the lot size shall be redefined as follows:

- If the partial lot contains one or two sublots, the sublots will be added to the previous lot.
- If the partial lot contains three or four sublots, the partial lot will be redefined to be an entire lot.

Each lot shall be tested for density by taking a nuclear density reading from two random test sites selected by the Engineer within each sublot or a single test site when sawn cores are used for acceptance. Test sites shall not be located within 12 inches of the edge of any application width for surface and intermediate mixes or within 18 inches of the edge of any application width for base mixes.

The average of the sublot density measurements will be compared to the target nuclear density, or for cores the target percent of theoretical maximum density achieved, established on the control strip to determine the acceptability of the lot. Once the average density of the lot has been determined, the Contractor will not be permitted to provide additional compaction to raise the average. If two consecutive sublots produce density results less than 98 percent or more than 102 percent of the target control strip density, the Contractor shall immediately notify the Engineer and institute corrective action. At each test site in the sublot, the Longitudinal Joints shall also be tested for density using a nuclear density gauge. For surface and intermediate mixes, the gauge shall be placed within 4 inches of the joint. For base mixes, the gauge shall be placed within 6 inches of the joint. The gauge shall not be placed over top of the joint. The joint density value shall be recorded. If a single longitudinal joint density reading is less than 95 percent of the target control strip density, the Contractor shall institute corrective action. The values obtained from the joint readings will not be used in payment calculation. By the end of the day's operations, the Contractor shall furnish the test data developed during the day's paving to the Engineer.

When sawn cores are used for density acceptance: The Contractor shall perform acceptance testing for density for each sublot by obtaining one sawed 4 inch by 4 inch specimen, or one 4-inch-diameter cores, at a single random test site specified by the Engineer.

- The sub-lot site shall be marked as described in VTM-76.

- The bulk specific gravity of the cores shall be determined in accordance with VTM-6.
- The density of the cores shall be determined in accordance with the requirements of VTM-22.

Cores or plugs shall be bulked in the presence of the Department. The Department reserves the right to have the cores or plugs bulked on the project site. Sublot test sites shall be numbered sequentially per lot, marked on the pavement, filled with the paving mixture, and compacted prior to completion of each day of production.

The tonnage of each lot will be based on the lot's width and length and the mixture application rate as designated in the Contract or as revised by the Engineer. Payment will be made in accordance with the requirements of Table III-4.

The Engineer at any time on any project may perform lot density verification testing. Lot density verification is performed by testing plugs. The Contractor shall be responsible for taking plugs for testing. Testing of the plugs will be done by the Engineer.

Surface, Intermediate, and Base mixes:

Two plugs shall be taken by the Contractor per Verification, Sampling and Testing (VST) lot at locations identified by the Engineer. If the density of the plugs does not conform to the requirements for the lot in question or the same payment percentage determined by the Contractor's testing for that lot, then the Contractor may request the referee procedure to be invoked. One additional plug from the remaining sublots will be taken. Payment for that lot, based on the results of the initial two plugs/cores or referee procedure, will be in accordance with the specifications in Table III-4 on the basis of the percentage of the control strip bulk density achieved.

2. **Surface, intermediate, and base courses** not having a sufficient quantity of material to run a roller pattern and control strip shall be compacted to a minimum density of 91.5 percent of the theoretical maximum density as determined in accordance with the requirements of VTM-22. The Contractor shall be responsible for cutting cores or sawing plugs for testing by the Department. One set of plugs/cores shall be obtained within the first 20 tons of small quantity paving and every 100 tons thereafter for testing by the Contractor or the Department. Core/plug locations shall be randomly selected. If the density is less than 91.5 percent, payment will be made in accordance with the requirements of Table III-5.

TABLE III-5

Payment Schedule for Surface, Intermediate and Base Courses (Not sufficient quantity to perform density roller pattern and control strip)

% TMD	% of Payment
Greater than 91.5	100
90.2-91.4	95
88.3-90.1	90

Any section in which a mixture (e.g., SM-9.0) is being placed at an application rate of less than 125 pounds per square yard, based on 110 pounds per square yard per inch, that does not have a sufficient quantity of material for a roller pattern and control strip shall be compacted by rolling a minimum of three passes with a minimum 8-ton roller. No density testing will be required.

For asphalt patching, the minimum density of 91.5 percent of the maximum theoretical density will be determined in accordance with the requirements of VTM-22. The Contractor is responsible for cutting cores or sawing plugs. One set of plugs/cores shall be obtained within the first 20 tons of patching material and every 500 tons thereafter for testing by the Contractor or the Department. Core/plug locations shall be randomly selected. If the density is less than the 91.5 percent, payment will be made on the tonnage within the 20 or 500 ton lot in accordance with the requirements of Table III-5 of the Specifications.

Section 315.05(g) Rumble Strips is amended to replace fourth paragraph with the following:

Following the cutting and cleaning of the depressions of waste material, the entire rumble strip area shall be coated with liquid asphalt coating (emulsion) using a pressure distributor. For rumble strips installed on the shoulder, the approximate application rate shall be 0.1 gallons per square yard. For rumble strips installed in a new asphalt concrete surface (new construction or overlay) along the centerline, no sealing of the rumble strip area shall be performed. When the rumble strip is installed along the centerline in an existing asphalt concrete surface (i.e. more than one year since placement), the approximate application rate shall be 0.05 gallons per square yard. The application temperature shall be between 160 degrees F and 180 degrees F. For shoulder rumble strips only, overspray shall not extend more than 2 inches beyond the width of the cut depressions and/or shall not come in contact with pavement markings.

Section 315.07(c) Thickness Tolerance is replaced with the following:

- (c) **Thickness Tolerance:** The thickness of the base course will be determined by the measurement of cores as described in VTM-32.

Acceptance of asphalt concrete base course for depth will be based on the mean result of measurements of samples taken from each lot of material placed. A *lot* of material is defined as the quantity being tested for acceptance except that the maximum lot size will be 1 mile of 24-foot-width base course.

A lot will be considered acceptable for depth if the mean result of the tests is within the following tolerance of the plan depth for the number of tests taken:

Plan Depth	1 test	2 tests	3 tests	4 tests
≤ 4"	0.6"	0.5"	0.4"	0.3"
>4." ≤8"	0.9"	0.7"	0.5"	0.4"
>8"≤12"	1"	0.9"	0.7"	0.5"
>12"	1.2"	1"	0.8"	0.6"

If an individual depth test exceeds the one test tolerance for the specified plan depth, that portion of the lot represented by the test will be excluded from the lot. If an individual test result indicates that the depth of material represented by the test is more than the tolerance for one test, the Contractor will not be paid for that material in excess of the tolerance throughout the length and width represented by the test. If an individual test

result indicates that the depth of the material represented by the test is deficient by more than the one test tolerance for the plan depth, correction of the base course represented by the test shall be made as specified hereinafter.

If the mean depth, based on two or more tests, of a lot of material is excessive (more than the plan depth), the Contractor will not be paid for that material in excess of the tolerance throughout the length and width represented by the tests.

If the mean depth, based on two or more tests, of a lot of material is deficient (less than the plan depth) by more than the allowable tolerance, the Contractor will be paid for the quantity of material that has been placed in the lot. Any required corrective action will be determined by the Engineer.

For excessive depth base courses, the rate of deduction from the tonnage allowed for payment as base course will be calculated at a weight of 115 pounds per square yard per inch of depth in excess of the tolerance. For sections of base course that are deficient in depth by more than the one test tolerance and less than two and half times the one test tolerance, the Contractor shall furnish and place material specified for the subsequent course to bring the base course depth within the tolerance. This material will be measured on the basis of tonnage actually placed, determined from weigh tickets, and paid for at the contract unit price for the base course material. Such material shall be placed in a separate course. If the deficiency is more than two and half times the one test tolerance, the Contractor shall furnish and place base course material to bring the base course thickness within the tolerance. Corrections for deficient base course depth shall be made in a manner to provide a finished pavement that is smooth and uniform. Sections requiring significant grade adjustments which have been previously identified and documented by the Engineer as being outside of the control of the Contractor will be exempt from deduction or corrective action.

When the Contract provides for the construction or reconstruction of the entire pavement structure, the surface and intermediate courses shall be placed at the rate of application shown on the plans within an allowable tolerance of ± 5 percent of the specified application rate for application rates of 100 pounds per square yard or greater and within 5 pounds per square yard for application rates of less than 100 pounds per square yard. The amount of material exceeding the allowable tolerance will be deducted from the pay quantities.

When the Contract provides for the placement of surface or intermediate courses over existing pavement, over pavements constructed between combination curb and gutter, or in the construction or reconstruction of shoulders, such courses shall be placed at the approximate rate of application shown on the plans. However, the specified rate of application shall be altered where necessary to produce the required riding quality.

Section 315.08—Measurement and Payment is amended to include the following:

Material Transfer Vehicle (MTV), when required in the Contract, will not be measured for separate payment. The cost for furnishing and operating the MTV shall be included in the price bid for other appropriate items.

Warm Mix Asphalt (WMA) additive or process will not be measured for separate payment, the cost of which, shall be included in the price bid for other appropriate items.

— DIVISION V – INCIDENTAL CONSTRUCTION —

**SPECIAL PROVISION COPIED NOTES (SPCNs), SPECIAL PROVISION (SPs) and
SUPPLEMENTAL SPECIFICATIONS (SSs)**

— **STANDARD 500 SERIES SPCNs, SPs, and SSs** —

(c510am1-1010)

LOCATING, REMOVING AND DISPOSING OF RECESSED PAVEMENT MARKERS AND RAISED SNOW-PLOWABLE MARKERS — The Contractor shall locate, remove and dispose of existing recessed pavement markers and raised snow-plowable markers prior to resurfacing. The cavity left by the removal of the existing recessed pavement markers shall be cleaned of debris, filled with the approved mix for resurfacing and compacted. Locating, removing and disposing of recessed pavement markers and raised snow-plowable markers; cleaning and filling the cavity, and compacting the material placed in the cleaned cavity will not be measured for payment. The cost for performing this work shall be included in the price bid for other appropriate items of work.

10-17-10 (SPCN)

(c512hg0-0708)

CONTRACTOR PROPOSED ALTERNATIVE TRAFFIC CONTROL PLANS -

The Contractor may prepare his own Contractor Alternative Traffic Control Plan (CATCP) as an alternative to that shown in the Contract Documents. This alternative plan must be prepared in conformance with the requirements of AASHTO; the latest approved editions of the Manual of Uniform Traffic Control Devices (MUTCD) and the Virginia Work Area Protection Manual. The Contractor must provide, as part of this alternative plan, information and explanations consistent with, and to the same level of detail, as the project-specific Traffic Control plans in the Contract Documents prepared by VDOT or its consultants. The alternative plan must clearly demonstrate coordination with the Contractor's overall, comprehensive plan for prosecuting the work, through its various phases or stages of construction and sequencing. The plan must be supported by a detailed transportation network traffic operations analysis, consistent with the complexity of the project, using a methodology or computer software program approved by the Department. This analysis must satisfactorily demonstrate the operating conditions of the network, and particularly, the work zone given expected traffic volumes during the length of the construction schedule.

As a necessary and integral part of the plan, the Contractor shall be responsible for identifying all utilities and right of way that will be impacted by his proposed CATCP, to include but not be limited to: underground utility designations, securing any additional or supplemental permissions or permits required to construct the project and preparing all analyses, plans, summaries, specifications, special provisions, etc., necessary to secure approvals to construct the project according to his alternative plan. The analyses, plans, summaries, specifications, and special provisions shall be directly prepared by or prepared under the supervision of a Professional Engineer registered to practice civil engineering in the Commonwealth of Virginia who is trained and/or certified in traffic control analysis and design. All such documents shall be signed and sealed by the Professional Engineer.

The Department reserves the right to accept or reject any CATCP developed under the provisions of this specification. The Contractor must obtain the Engineer's written approval before beginning any work using a Contractor Alternative Traffic Control Plan for Maintenance of Traffic. The Engineer's written approval is required for all modifications to the accepted Contractor Alternative Traffic Control Plan. The Engineer will permit changes to the CATCP without proper documentation and authorization only in emergency situations where incident management is critical.

The Engineer's acceptance of the Contractor's Alternative Traffic Control Plan will not relieve the Contractor of his responsibility for all related project impacts, costs, delays, or damages, whether direct or indirect, resulting from Contractor initiated changes in the design or construction activities from those detailed in the original Contract specifications, design plans, including the Department's temporary traffic control plans or other Contract Documents and which effect a change in project work different from that shown in the plans, joint project agreements, or other project construction schedules. No additional compensation or extension of time for contract completion will be considered in conjunction with the Contractor's decision to proceed with use of a Contractor Alternative Traffic Control Plan that is approved by the Engineer.

3-27-08, Reissued 7-2008 (SPCN)

VIRGINIA DEPARTMENT OF TRANSPORTATION
SPECIAL PROVISION FOR
CG-12 DETECTABLE WARNING SURFACE

September 18, 2013

I. DESCRIPTION

This work shall consist of providing all labor, tools, equipment, and materials required to furnish and install detectable warning surfaces in the location(s) specified on the plans or in the proposal. The Contractor shall perform the work according to the details shown on the plans or in this special provision, Section 504 of the Specifications, and as directed by the Engineer.

II. MATERIALS

Materials shall conform to the requirements of Section 504 of the Specifications except as follows:

Permanent, durable materials suitable for heavy traffic outdoor areas or concrete pavers approved by the Department may be used to construct the detectable warning surfaces where called for in the plans and other contract documents. Concrete paver units shall conform to the current ASTM C936 specifications and the details and requirements shown in the plans. Other durable materials shall be in accordance with Department approved manufacturer's design and specification requirements.

Products not on the Departments Materials Approved Product list shall be submitted to the Standards & Special Design Section and the appropriate District Materials Engineer for approval prior to use.

All detectable warning surfaces shall meet the ADA Standards as set forth by the United States Access Board.

The detectable warning shall be "safety yellow" unless otherwise noted in the plans or directed by the Engineer.

When visual contrast other than "safety yellow" is specified in the plans or contract documents, the *detectable warning* surfaces shall contrast visually with adjacent walking surfaces either light-on-dark, or dark-on-light. Verification of visual contrast is required prior to installation.

III. PROCEDURES

Construct sidewalk ramp according to Section 504 of the Specifications except for detectable warning/truncated domes that shall be furnished or constructed in accordance with the details in this specification, the manufacturer's recommendations, the Standard Drawings and the Plans.

All permanent installations of detectable warning surfaces shall be "wet set" in freshly placed concrete.

Surface mounted detectable warning surfaces are permitted only for temporary installations where the detectable warning will be in service 6 months or less.

The Contractor shall provide the Department with the manufacturers installation instructions.

IV. MEASUREMENT AND PAYMENT

CG-12 Detectable Warning Surface will be measured in square yards and paid for at the contract unit price per square yard, complete-in-place. This price shall be full compensation for furnishing and installing approved truncated dome finished materials including but not limited to concrete pavers, other Department approved materials, integral visual contrast, dowels and all other labor, tools, equipment, materials and incidentals necessary to fully complete the work.

Payment will be made under:

Pay Item	Pay Unit
CG-12 Detectable Warning Surface	Square yard

VIRGINIA DEPARTMENT OF TRANSPORTATION
SPECIAL PROVISION FOR
SECTION 512—MAINTAINING TRAFFIC – NON-SCHEDULES (LUMP SUM)

June 25, 2010C

SECTION 512 of the Specifications is amended as follows:

Section 512.03—Procedures is amended to add the following:

The Contractor shall submit a plan, sequenced with his plan of operations, to the Engineer for maintenance of traffic for his review prior to commencement of work. The plan shall be designed and implemented in accordance with the *Virginia Work Area Protection Manual*, the *MUTCD* and the Department generated project-specific temporary traffic control plan or requirements provided in the Contract Documents. When the Department provides a sequence of construction in the Contract documents the plans or estimated quantities for maintenance of traffic items are for estimating purposes only.

Section 512.04—Measurement and Payment is replaced with the following:

Maintenance of traffic including flagger service, pilot vehicles, electronic arrows, warning lights, channelizing devices, traffic barrier service, traffic barrier service guardrail terminals, impact attenuator service, construction pavement markings, construction pavement message markings, temporary pavement markers, eradication of existing pavement markings, temporary detours, aggregate material, Type III barricades, construction signs, and truck mounted attenuators will be paid for on a lump sum basis as follows:

- (a) **Per structure** wherein, the lump sum price bid shall be for providing maintenance of traffic for a single structure identified in the Contract by its structure number. No measurement will be made.
- (b) **Per route and location(s)** wherein, the lump sum price bid shall be for providing maintenance of traffic for work at a specified location on a single specified route or, specified locations grouped together on a single specified route as one lump sum item. No measurement will be made as detailed in the Contract.

The Contractor's price bid shall include, but not be limited to; providing a person to meet the basic work zone traffic control and intermediate work zone traffic control requirements of Section 105.14 of the Specifications; furnishing, placing, maintaining, replacing, relocating, adjusting, aligning, removing, flagger service, pilot vehicles, warning lights, electronic arrow, channelizing devices, traffic barrier service, traffic barrier service guardrail terminals, impact attenuator service, construction pavement markings, construction pavement message markings, temporary pavement markers, eradication of existing pavement markings, temporary detours, aggregate material, Type III barricades, construction signs, truck mounted attenuators, and all labor, material and equipment incidental to completing this work in accordance with the *Virginia Work Area Protection Manual* and traffic engineering guidelines and principles. Site specific adjustments to maintenance of traffic operations specified by the *Virginia Work Area Protection Manual* and the *MUTCD* such as quantity, location, or spacing of traffic control devices within construction limits or on any approaches to the project, required by the Engineer to improve traffic operation or safety shall be considered an alteration to the character of work in accordance with the provisions of Section 104.02 of the Specifications.

The Contractor will be paid 30 percent of the lump sum bid price upon satisfactory installation of the required maintenance of traffic items to commence construction operations and active

prosecution of the work. Contingent upon active pursuit of the work, the Contractor will receive monthly payments for maintenance of traffic based on the daily dollar amount of the bid price for maintenance of traffic until 90 percent of the unit bid price is paid. The remaining 10 percent will be paid for after all maintenance of traffic items are removed at final acceptance of the Contract.

Additional traffic control layout detail items that are determined and authorized by the Engineer to be necessary to ensure the safety of the traveling public and are **in addition to the number required** by the traffic control layout details in the *VWAPM*, the drawings in herein, and the Contract, will be measured and paid for as follows, therefore, the provisions of Section 104.02 will not apply:

- **Flagger service** shall include furnishing certified flagger, paddles and safety equipment. Where additional flagger service is required, as determined and authorized by the Engineer, flagger service will be measured in hours and paid for at the rate of **\$15** per hour of use.

When flagger service is used for the Contractor's convenience, such as for ingress and egress of construction equipment or materials, payment will not be made. **Note:** The required flaggers described in the two flagging conditions in Section 512.03(b)2. herein will not be measured as a separate pay item but will be considered incidental to the traffic control operations described.

- **Pilot vehicles** shall include furnishing vehicles, necessary warning devices, drivers, fuel and maintenance. Where additional pilot vehicles are required as determined and authorized by the Engineer, such vehicles will be measured in hours of actual use and will be paid for at the rate of **\$23** per hour of employed use.
- **Electronic arrows** shall include furnishing arrow panels, fuel, maintenance, and a truck or trailer having flashing amber warning lights for mobility of the electronic arrow. Where additional electronic arrows are required as determined and authorized by the Engineer, electronic arrows will be measured in hours of actual use and will be paid for at the rate of **\$5** per hour for each hour of employed use.
- **Warning lights** for use on sign panels or installed on traffic barrier service will not be measured for separate payment. The cost thereof shall be included in the price for other appropriate pay items. This shall include maintaining, relocating, and removing.
- **Group 1 channelizing devices** will not be measured for separate payment. The cost thereof shall be included in the price for other appropriate pay items.
- **Group 2 channelizing devices**, not designated in the Contract as a separate pay item but where additional Group 2 channelizing devices are required as determined and authorized by the Engineer, these will be measured in days and paid for at the rate of **\$1** per day per device. This price shall include furnishing and maintaining devices, removing devices when no longer required and signs. When group 2 channelizing devices are moved to a new location or are removed and re-installed at the same location, they will be measured for separate payment. However, when group 2 channelizing devices are moved within the lane or from one lane to another by simply moving the devices across the lane edge line without removal from the roadway, no additional payment will be made.
- **Traffic barrier service** will not be measured for separate payment. The cost thereof shall be included in the price for other appropriate pay items. This shall include warning lights, delineators, barrier vertical panels, fixed object attachments, patching restraint holes, fixed object attachments used on traffic barrier service in locations where existing guardrail is in

place including restoring existing guardrail to its original condition, maintaining, and removing traffic barrier service when no longer required.

- **Traffic barrier service guardrail terminal** will not be measured for separate payment. The cost thereof shall be included in the price for other appropriate pay items. This shall include furnishing, installing, moving to a new location as directed or approved by the Engineer, and removing when no longer needed.
- **Impact attenuator service** will not be measured for separate payment. The cost thereof shall be included in the price for other appropriate pay items. This shall include Impact attenuators used with barrier openings for equipment access.
- **Construction pavement markings** will not be measured for separate payment. The cost thereof shall be included in the price for other appropriate pay items. This shall include furnishing marking materials, preparing the surface, adhesive, installation, maintaining, removing removable markings when no longer required, inspections, and testing.
- **Construction pavement message markings** will not be measured for separate payment. The cost thereof shall be included in the price for other appropriate pay items. This shall include marking materials, preparing the surface, adhesive, maintaining, and removing removable markings when no longer required.
- **Temporary pavement markers** will not be measured for separate payment. The cost thereof shall be included in the price for other appropriate pay items. This shall include furnishing and installing pavement markers, surface preparation, adhesive, and maintaining and replacement of lost or damaged markers and removing the pavement markers and adhesive when no longer required.
- **Aggregate material** will not be measured for separate payment. The cost thereof shall be included in the price for other appropriate pay items. This shall include preparing the grade and furnishing, placing, maintaining, and removing material as required.
- **Type III barricades** will not be measured for separate payment. The cost thereof shall be included in the price for other appropriate pay items. This shall include furnishing and placing barricades, retroreflective sheeting, maintaining, relocating to new locations and removing when no longer required.
- **Construction signs** except those already required by the Contract (which includes those signs required by the VWAPM, the drawings herein, and such signs as “**Loose Gravel**”, “**Unmarked Pavement**”, and “**Low Shoulder**” that may be required by the Engineer to ensure the safety of the traveling public due to the nature of the Contractor's operations) when determined and authorized by the Engineer, will be measured in square feet and paid for at **\$20** per square foot. This payment, based on square footage, shall be compensation for furnishing, placing, relocating, covering, uncovering, and removing the sign(s) when no longer needed for the duration of the project; multiple payments for the same sign used more than once will not be allowed. Such extra signs will consist of either a greater number of the standard signs already listed in the applicable traffic control layout details in the VWAPM, the drawings herein, and the Contract, or other signs included in the VWAPM but not originally considered applicable for use on this Contract.
- **Truck mounted attenuators**, not designated in the Contract as a separate pay item but where additional Truck Mounted Attenuators are required as determined and authorized by the Engineer, these will be measured in hours of actual use required, and will be paid for at the rate of **\$22** per employed hour. This price shall include furnishing the truck mounted attenuator, mounting vehicle, lights, electronic arrows, if allowed but not

required, and maintenance. When electronic arrows are used at the option of the Contractor in lieu of the rotating or high intensity amber strobe light, the cost of the electronic arrow shall be included in the price for truck mounted attenuators. When electronic arrows are required and authorized as determined by the Engineer and not incidentally mounted (and permitted) on such truck mounted attenuator support vehicles, they will be paid for separately as specified herein.

- **Portable traffic control signal** will not be measured for separate payment. The cost thereof shall be included in the price for other appropriate pay items. This shall include portable traffic control signal equipment, installation, energy source, maintaining, adjusting, aligning, removing and relocating equipment.
- **Portable Changeable Message Signs (PCMS)**, not designated in the Contract as a separate pay item but where additional Portable Changeable Message Signs are required as determined and authorized by the Engineer, these will be measured in hours of actual use and paid for at the rate of **\$15** per hour for each hour of employed use. This price shall be full compensation for furnishing or mobilizing the unit(s) to the project, maintenance, operation, and repositioning the unit(s).

Payment will be made under:

Pay Item	Pay Unit
Maintenance of traffic (Structure No.)	Lump sum
Maintenance of traffic (Route and Location[s])	Lump sum

VIRGINIA DEPARTMENT OF TRANSPORTATION
SPECIAL PROVISION FOR
INFORMAL PARTNERING

January 14, 2008

I. DECLARATION AND DESCRIPTION

The Virginia Department of Transportation (VDOT) is firmly committed to the formation of a partnering relationship with the Contractor, all subcontractors, suppliers, FHWA representatives; where appropriate, other federal agencies, local government officials, utilities representatives, law enforcement and public safety officials, consultants, and other stakeholders to effectively and efficiently manage and complete each construction or maintenance contract to the mutual and individual benefits and goals of all parties. Partnering is an approach to fulfilling this commitment where all parties to the contract, as well as individuals and entities associated with or otherwise affected by the contract, willingly agree to dedicate themselves by working together as a team to fulfill and complete the construction or maintenance contract in cost effective ways while preserving the highest standards of safety and quality called for by the contract documents combined with the goals of on time/on budget completion. The approach must still allow for the fact that the members of the team share many common interests yet have differing authorities, interests, and objectives that must be accommodated for the project to be viewed as successful by all parties. It is recognized by VDOT that partnering is a relationship in which:

- Trust and open communications are encouraged and expected by all participants
- All parties move quickly to address and resolve issues at the lowest possible level by approaching problems from the perspectives and needs of all involved
- All parties have identified common goals and at the same time respect each other's individual goals and values
- Partners create an atmosphere conducive to cooperation and teamwork in finding better solutions to potential problems and issues at hand

II. INFORMAL PARTNERING STRUCTURE

It is the business intent of the Department that informal partnering will be required on this project, whereby the spirit and principles of partnering are practiced from onsite field personnel to executive level owners and employees. The VDOT Field Guide to Partnering available on the VDOT website <http://www.virginiadot.org/business/resources/partnerfinalallowres.pdf> will be the standard reference guide utilized to structure and guide partnering efforts. This guide will be systematically evaluated to incorporate better practices as our partnering efforts evolve. Of particular note is the need for effective and responsive communication between parties to the partnering relationship as emphasized by the Special Provision for Project Communication and Decision Making now included as standard provision in all contracts advertised by the Scheduling and Contract Division of VDOT.

Informal partnering need not require the services of a professional facilitator and may be conducted by the actual partnering participants themselves. Informal partnering, and more specifically the Partnering Charter, will not change the legal relationship of the parties to the Contract nor relieve either party from any of the terms of the Contract.

III. PROCEDURES

The following are general procedures for informal partnering and are not to be considered as inclusive or representative of procedural requirements for all projects. Participants shall consult

the VDOT Field Guide for Partnering for assistance in developing specific guidelines to those efforts required for their individual projects.

At least 5 days prior to or in connection with the preconstruction conference the Contractor shall attend a conference with the Engineer at which time he and the Engineer shall discuss the extent of the informal partnering efforts required for the project, how these have been accommodated in the Contractor's bid and the identity of expectations and stakeholders associated with the project. Informal partnering efforts require the Department and the Contractor to mutually choose a single person from among their collective staffs, or a trained facilitator to be responsible for leading all parties through the VDOT Field Guide to Partnering and any subsequent partnering efforts.

Partnering Meetings During Project Construction

In informal partnering efforts the Contractor shall provide a location for regularly scheduled partnering meetings during the construction period. Such meetings will be scheduled as deemed necessary by either party. The Contractor and VDOT will require the attendance of their key decision makers, including subcontractors and suppliers. Both the Contractor and VDOT shall also encourage the attendance of affected utilities, concerned businesses, local government and civic leaders or officials, residents, and consultants, which may vary at different times during the life of the Contract. The Department and the Contractor are to agree upon partnering invitees in advance of each meeting. Follow-up partnering workshops may be held throughout the duration of the project as deemed necessary by the Contractor and the Engineer.

IV. MEASUREMENT AND PAYMENT

Informal Partnering, because the extent to which certain partnering activities are pursued is at the Contractor's option, and may vary according to project complexity, work history between the parties, project duration, the Contractor's own unique methods, means, and schedule to execute and complete the work, etc.; will not be paid for as a separate bid item but the all costs associated with informal partnering efforts for the duration of the work shall be considered inclusive and incidental to the cost of other appropriate items.

VIRGINIA DEPARTMENT OF TRANSPORTATION
2007 ROAD AND BRIDGE SUPPLEMENTAL SPECIFICATIONS

SUPPLEMENTAL SECTION 512—MAINTAINING TRAFFIC

SECTION 512—MAINTAINING TRAFFIC of the Specifications is amended as follows:

Section 512.03(a) Signs is amended to replace the last paragraph with the following:

When construction signs are covered to prevent the display of the message, the entire sign shall be covered with silt fence or other materials approved by the Engineer such that no portion of the message side of the sign shall be visible. Plywood shall be used on ground-mounted construction signs only. Attachment methods used to attach the covering material to the signs shall be of a durable construction that will prevent the unintentional detachment of the material from the sign. At no times shall a construction sign and/or post be rotated to prevent the display of the message. In addition, the posts where the signs are being covered shall have two ED-3 Type II delineators mounting vertically on the post below the signs at a height of 4 feet to the top of the topmost delineator. The bottom delineator shall be mounted 6 inches below the top delineator.

Section 512.03(b) Flagger Service and Pilot Vehicles is amended to replace the last paragraph with the following:

Portable traffic control signals conforming to the requirements of Section 512.03(h)2 of the Specifications may be used in lieu of flagger service when specified or approved by the Regional Traffic Engineer. When portable traffic control signals are used in lieu of flagger service, the portable traffic control signals will be measured and paid for separately.

Section 512.03(e)b. Group 2 devices is amended to replace the first paragraph with the following:

- b. **Group 2 devices** shall be drums or vertical panels. Drums shall be round, or partially round with no more than one flat side; made from plastic; have a minimum height of 36 inches, have a cross-sectional width no less than 18 inches in any direction; and conform to the requirements of the *Virginia Work Area Protection Manual*. Drums shall be designed to allow for separation of ballast and drum upon vehicular impact but not from wind and vacuum created by passing vehicles. Drums of two-piece design, i.e., drum and associated base, shall utilize sufficient amounts of enclosed sand at the base in accordance with the manufacturer's recommendations to provide stable drum support. The base shall be not greater than 5 inches in height. Two-piece drums may also utilize a flared drum foundation and collar of not more than 5 inches in height and of suitable shape and weight to provide stable support. One-piece drums may be used provided they comply with these above requirements.

Section 512.03 Procedures is amended to add (r) **Work Zone Traffic Control** as the following:

- (r) **Work Zone Traffic Control:** The Contractor shall provide individuals trained in Work Zone Traffic Control in accordance with the requirements of Section 105.14 of the Specifications.

Section 512.04 Measurement and Payment is amended to add the following:

Basic Work Zone Traffic Control – Separate payment will not be made for providing a person to meet the requirements of Section 105.14 of the Specifications. The cost thereof shall be included in the price of other appropriate pay items.

Intermediate Work Zone Traffic Control - Separate payment will not be made for providing a person to meet the requirements of Section 105.14 of the Specifications. The cost thereof shall be included in the price of other appropriate pay items.

Section 512.04 Measurement and Payment is amended to replace the pay item and corresponding pay unit for “**Eradication of existing pavement markings**” with the following:

Eradication of existing pavement markings will be measured in linear feet of a 6-inch width or portion thereof as specified herein. Widths that exceed a 6-inch increment by more than 1/2 inch will be measured as the next 6-inch increment. Measurement and payment for eradication of existing pavement markings specified herein shall be limited to linear pavement line markings. Eradication of existing pavement markings will be paid for at the contract unit price per linear foot. This price shall include removing linear pavement line markings and disposing of residue.

Eradication of existing nonlinear pavement markings will be measured in square feet based on a theoretical box defined by the outermost limits of the nonlinear pavement marking. Nonlinear pavement markings shall include but not be limited to stop bars, arrows, images and messages. Eradication of existing nonlinear pavement markings will be paid for at the contract unit price per square foot. This price shall include removing nonlinear pavement markings and disposing of residue.

Payment will be made under:

Pay Item	Pay Unit
Eradication of existing pavement marking	Linear foot
Eradication of existing nonlinear pavement marking	Square foot

VIRGINIA DEPARTMENT OF TRANSPORTATION
2007 ROAD AND BRIDGE SUPPLEMENTAL SPECIFICATIONS

SUPPLEMENTAL SECTION 515—PLANING OR MILLING PAVEMENT

SECTION 515—PLANING PAVEMENT of the Specifications is completely replaced with the following:

SECTION 515—PLANING OR MILLING PAVEMENT

515.01—Description

This work shall consist of planing (milling) of rigid or flexible pavement to the designated depth specified in the plans or other Contract documents in preparation for pavement repair or pavement overlay. For the purposes of this section, rigid pavement shall mean hydraulic cement concrete pavement or hydraulic cement concrete surfaced pavements. Flexible pavement shall mean asphalt concrete or asphalt concrete surface pavements. Planing as used herein is also referred to as milling or grinding. Milled cuttings shall be removed and disposed of by the Contractor in accordance with the requirements of Section 106.04 of the Specifications or used in the work if permitted in the Contract or directed by the Engineer.

515.02—Equipment

Planing shall be performed with a pavement planing or pavement grinding machine of a type that has operated successfully on work comparable to that specified in the Contract. Milling and cold planing equipment shall be capable of accurately cutting to the length, width, depth and typical section specified in the Contract in flexible pavement or rigid pavement while leaving a uniformly cut or ground roadway surface capable of handling traffic prior to overlay placement. The milling equipment shall not damage the underlying pavement surface. The milling machine shall be equipped with an automatic grade control system that will control the longitudinal profile and cross slope of the existing pavement milled surface as the milling operations proceed. The ground speeds of the machine and the cutting equipment shall be independent. The machine shall have a self-contained water system for the control of dust and fine particles. The width of the machine shall allow for the passage of controlled public traffic while in use. The machine shall have a dust collection system or have a system to minimize dust created by the planing (milling) operation from escaping into the atmosphere.

The Contractor shall continuously monitor the cutting or grinding head of the machine so as to ensure and maintain the creation of a uniformly textured milled surface. Equipment and vehicles in use under traffic shall be equipped according to the requirements of the Work Area Protection Manual.

515.03—Procedures

Limitations of operations for planing operations shall be in accordance with the requirements of Section 108.02 of the Specifications and as specified in the Contract.

The Contractor may perform either regular planing or performance based planing at his option unless otherwise specified in the Contract. Unless otherwise directed by the Engineer, the finished surface for regular pavement planing and performance planing shall have a tolerance of plus or minus 1/4 inch per foot between any two contacts of the resultant surface and the testing edge of a 10-foot straightedge.

No application of pavement overlay shall decrease the vertical clearance under a bridge. In situations where the existing pavement under the overpass cannot be planed in direct proportion

to the proposed overlay, the new pavement is to be tied down to the existing pavement under the overpass no less than 75 feet from the outer edges of the overpass in accordance with Standards.

The finished surface macrotexture for performance planing shall have a pavement macrotexture MTD (mean texture depth) of less than 2.0 millimeters. Testing for performance pavement planing shall be as described hereinafter.

Irregularities and high spots of existing pavement shall be eliminated. The pavement surface shall be milled, ground or planed to the designated grade or gradient as specified on the plans, or where not specified as a grade, shall parallel that of the existing roadway. Transversely, the cross slopes of tangent sections shall be planed to approximately 1/4 inch per foot or as directed by the Engineer. Superelevated curves shall be planed as directed by the Engineer. Where the pavement is to be resurfaced by means of the application of an overlay on curb and gutter roadways, a 1-inch shoulder shall be cut along the gutter line to eliminate the necessity of feathering the edge of the new surface. Payment for providing the 1-inch shoulder shall be based on the total square yards of removed material regardless of the variable depth of the pass.

The finished planed surface shall be true to grade, free from gouges, grooves, ridges, soot, oil film, and other imperfections and shall have a uniformly textured appearance suitable as a temporary riding surface.

Humps and depressions that exceed the specified tolerances and require additional grinding or planing will be subject to correction or replacement as directed by the Engineer at no additional cost to the Department.

The Contractor shall ensure positive drainage is provided for all planed surfaces in accordance with the requirements of Section 315.05(c) of the Specifications. When planing curb and gutter sections the Contractor shall endeavor to work with existing drainage and grades to maintain positive flow. In the event of significant buildup of standing water, the Contractor may be required to erect signage to warn motorists, sweep the roadway to vacate the water, or in extreme cases, close the lane to traffic until proper drainage of the planed surface can be restored.

Temporary transverse pavement-wedge tie-ins shall be constructed where planed existing pavement is to remain temporarily without overlay to the extent allowed or required herein, in Section 315 of the Specifications, elsewhere in the Contract documents, or by the Engineer. Each tie-in shall be constructed no less than 3 feet in length for every inch of depth of pavement planing performed and shall consist of a mix that is suitable for a riding surface that provides a smooth transition between planed existing pavement and existing pavement or bridge decks. Such tie-ins shall be constructed prior to the planed surface being opened to traffic.

When planing to a depth of 2 inches or less at a bridge, the planed (milled) surface at the bridge may be left unpaved for up to 10 days.

Additional or other limitations and conditions to planing operations will be as specified and applicable to the Contract.

515.04—Performance Pavement Planing Testing

This section gives testing procedures and criteria for opening a section of performance planed pavement to public traffic on roadways with posted speed limits of 55 mph or greater as specified herein. The test procedure performed by the Contractor shall measure the mean texture depth (MTD) of the resultant macrotexture surface after performance planing operations have been completed. The measurement for performance planed surface texture shall be conducted in accordance with the requirements of ASTM E965 using a volumetric technique. The Contractor shall randomly select 10 locations at each site. Each individual location shall be tested and the

average MTD of the entire 10 locations per site determined. Prior to opening a lane or roadway to traffic the average MTD of the performance planed site shall be less than 2.0 millimeters and the upper limit for any one MTD measurement shall not exceed 3.10 millimeters in order for that site to be exposed to traffic.

515.05—Measurement and Payment

Where pavement is to be planed to a uniform depth, planing will be measured in square yards of removed pavement of the surface area to the depth(s) specified in the contract documents. The Engineer may direct the depth to be adjusted during the initial pass $\pm \frac{1}{2}$ inch due to field conditions at no additional cost, except where such adjustment constitutes a changed condition as explained herein. The planed area is defined as the actual length and width of the planed pavement surface visually verified and accepted by the Engineer for payment. If scabbing or laminations still exist after planing to the maximum potential depth of the initial pass, the Engineer may direct the Contractor to perform additional passes or to increase the depth beyond the maximum potential depth of the initial pass. Such additional passes or increased depth beyond the maximum potential depth of the initial pass will also be measured and paid for in square yards for the depth authorized by the Engineer. Such additional depth passes (beyond the maximum potential depth of the original pass) will not be adjusted, as in averaging or as a percentage of original depth or maximum potential depth of the initial pass, to achieve final measurement or payment. In the event the authorized adjustment of the $\frac{1}{2}$ inch for field conditions by the Engineer changes the requirements of the “square up” provisions (in excess of 2 inches), this will be considered a changed condition in accordance with the provisions of Section 104.02 of the Specifications.

Where planing is variable depth and used to tie into existing structures such as curbs and combination curb and gutters and at bridges, except in cases as mentioned below, such tie-in planing will be measured in square yards of removed pavement for the full surface area (the actual length and width of the planed pavement surface visually verified and accepted by the Engineer for payment) within the range of depth specified in the contract documents. **Note:** The Engineer may direct the depth to be adjusted during the initial pass $\pm \frac{1}{2}$ inch of the specified depth due to field conditions such as scabbing or delamination at no additional cost, except where such adjustment constitutes a changed condition as explained herein.

If scabbing or laminations still exist after planing to the maximum potential depth of the initial tie-in planing pass, the Engineer may direct the Contractor to perform additional passes or to increase the depth beyond the maximum potential depth of the initial **pass**. Additional passes or depths beyond the maximum potential depth of the initial **pass**, authorized by the Engineer, will also be measured and paid for in square yards of removed pavement of the additional surface area for the depth authorized by the Engineer. Areas of variable depth tie-in planing will not be adjusted, as in averaging or as a percentage of original depth, to achieve final measurement or payment. In the event the authorized adjustment of the $\frac{1}{2}$ inch for field conditions by the Engineer changes the requirements of the “square up” provisions, this will be considered a changed condition in accordance with Section 104.02 of the Specifications.

Planing performed to tie-in overlaid pavement to existing pavement or bridge decks that is determined by the Engineer to be a part of the mainline planing operations will not be measured for separate payment, the cost of which, shall be included in the price bid for the appropriate depth range of flexible or rigid pavement planing.

This price shall include furnishing vehicles, labor, tools, materials, incidentals, safety equipment, warning devices, and removing and disposing of existing pavement.

Payment will be made under:

Pay Item	Pay Unit
Flexible pavement planing (0-2" depth)	Square yard
Flexible pavement planing (Above 2"-4" depth)	Square yard
Flexible pavement tie-in planing (0-2" depth)	Square yard
Flexible pavement tie-in planing (Above 2"-4" depth)	Square yard
Flexible pavement planing (over 4" depth)	Square yard
Rigid pavement planing (0-2" depth)	Square yard
Rigid pavement tie-in planing (0-2" depth)	Square yard

VIRGINIA DEPARTMENT OF TRANSPORTATION
SPECIAL PROVISION FOR
RIGHT-OF-WAY MONUMENTATION AND FINAL BOUNDARY STAKEOUT

December 2, 2009a

The number of **right-of-way monuments** to be set for this contract are 6.

The Contractor shall furnish right-of-way monuments and ensure the setting of such monuments and final boundary stakeout is performed by or under the direct responsibility, control and personal supervision of a Land Surveyor currently licensed and able to practice in the Commonwealth of Virginia.

SECTION 503 is added to the Specifications as a complete section as follows:

SECTION 503—RIGHT-OF-WAY MONUMENTS

503.01—Description

This work shall consist of furnishing and setting right-of-way monuments at locations shown on the plans or as designated by the Engineer in accordance with the requirements of the Standard Drawings and the Department's Survey Manual.

503.02—Materials

Right-of-way monuments shall conform to the requirements of Section 219 of the Specifications.

503.03—Procedures

Monuments shall be placed at locations designated on the plans, by the Engineer or as required by the Department's Survey Manual

Excavation shall be kept to the minimal for installation so as minimize the disturbance of in-situ material and compaction and backfill efforts. Backfill shall be thoroughly compacted in a manner that will not displace the monument.

503.04—Measurement and Payment

Right-of-way monuments will be measured in units of each, complete-in-place, and will be paid for at the contract unit price per each. This price shall include furnishing, installing, excavating, backfilling and compaction.

Payment will be made under:

Pay Item	Pay Unit
Right-of-way monument (Standard)	Each

SECTION 517—CONTRACTOR CONSTRUCTION SURVEYING of the Specifications is amended as follows:

Section 517.02—General Requirements is amended to add the following:

- (e) location, final boundary stakeout, and final right of way monumentation

Section 517.04(i) Right of way and boundary stakeout affecting property ownership is amended to replace the last sentence with the following:

Final boundary stakeout shall be performed in accordance with the Department's Survey Manual by or under the direct responsibility, control and personal supervision of a Land Surveyor currently licensed and able to practice in the Commonwealth of Virginia.

Section 517.04(j) Locating and setting right-of-way monuments is replaced with the following:

- (j) **Locating and setting right-of-way monuments:** Final right of way monumentation shall be performed in accordance with the Department's Survey Manual and Section 503 herein by or under the direct responsibility, control and personal supervision of a Land Surveyor currently licensed and able to practice in the Commonwealth of Virginia.

Hub and tack points for RM-1 right-of-way monuments shall be set in accordance with the Road and Bridge Standards. The Contractor shall furnish RM-2 right-of-way monuments and locator posts. The Department will furnish the required caps for installation by the Contractor. Surveying work and drawings shall be in accordance with the requirements of *Sample Figure 4 in Chapter 8—Construction Surveys* of the Survey Manual. Where required by the Department's Survey Manual all drawings, layouts, field notes, documentation, etc shall be signed and sealed by the licensed Land Surveyor. The Certified record drawings, field notes, and computations shall be submitted to the Engineer.

Upon completion of the project, the Contractor shall provide the Engineer with all original surveying drawings, field notes, layouts, computations, sketches and drawings in the format approved by the Engineer. All electronic copies submitted shall be in a format fully compatible with the Department's existing computer hardware and software.

Section 517.05(h) Right of way and boundary stakeout affecting property ownership is amended to replace the last sentence with the following:

Final boundary stakeout shall be performed in accordance with the Department's Survey Manual by or under the direct responsibility, control and personal supervision of a Land Surveyor currently licensed and able to practice in the Commonwealth of Virginia.

Section 517.05(i) Setting right-of-way monuments is replaced with the following:

- (i) **Setting right-of-way monuments:** Final right of way monumentation shall be performed in accordance with the Department's Survey Manual and Section 503 herein by or under the direct responsibility, control and personal supervision of a Land Surveyor currently licensed and able to practice in the Commonwealth of Virginia.

Hub and tack points for RM-1 right-of-way monuments shall be set in accordance with the Road and Bridge Standards. The Contractor shall furnish RM-2 right-of-way monuments and locator posts. The Department will furnish the required caps for installation by the Contractor. Surveying work and drawings shall be in accordance with the requirements of *Sample Figure 4 in Chapter 8—Construction Surveys* of the Survey Manual. Where required by the Department's Survey Manual all drawings, layouts, field notes,

documentation, etc shall be signed and sealed by the licensed Land Surveyor. Certified record drawings, field notes, and computations shall be submitted to the Engineer.

Upon completion of the project, the Contractor shall provide the Engineer with all original surveying drawings, field notes, layouts, computations, sketches and drawings in the format approved by the Engineer. All electronic copies submitted shall be in a format fully compatible with the Department's existing computer hardware and software.

— DIVISION VII – TRAFFIC CONTROL DEVICES —

**SPECIAL PROVISION COPIED NOTES (SPCNs), SPECIAL PROVISION (SPs) and
SUPPLEMENTAL SPECIFICATIONS (SSs)**

— **STANDARD 700 SERIES SPCNs, SPs, and SSs** —

SECTION 700—GENERAL of the Specifications is amended as follows:

Section 700.04—Procedures is amended to include the following:

(k) Anchor Bolts

Traffic control device foundations shall have a bolt template positioned for correct orientation of the structure with respect to the structure location and roadway alignment and to maintain the anchor bolts vertical (plumb) and level during construction.

Bolt and/or anchor nut covers shall not be installed on any traffic control device structures, unless otherwise specified on the plans.

Anchor bolts in double-nut connections shall extend a minimum of $\frac{1}{4}$ " past the second top nut.

The threaded portion of the anchor bolts shall be lubricated with beeswax, the bolt manufacturer's recommended lubricant, or other lubricant as approved by the Engineer for proper tensioning before the structure is installed.

Double-nut connections installation procedure: (A minimum of three nuts and two hardened washers shall be provided for each anchor bolt.)

1. If bolt(s) are not plumb (vertical), determine if beveled washer(s) may be required prior to erection of the structure. Beveled washers shall be used on top of the leveling nut and/or under the first top nut if any face of the base plate has a slope greater than 1:20 and/or any nut could not be brought into firm contact with the base plate.
2. Clean and lubricate the exposed thread of all anchor bolts, nuts and all bearing surfaces of all leveling nuts. Re-lubricate the exposed threads of the anchor bolts and the threads of the nuts if more than 24 hours has elapsed since earlier lubrication, or if the anchor bolts and nuts have become wet since they were first lubricated.
3. Verify that the nuts can be turned onto the bolts the full length of the threads by hand.
4. Turn the leveling nuts onto the anchor bolts and align the nuts to the required elevation shown on the shop drawings. The maximum distance between the bottom of the leveling nut and the top of the foundation shall be one inch.
5. Place structural hardened washers on top of the leveling nuts (one washer corresponding to each anchor bolt).
6. The post or end frame shall be plumbed or aligned as shown on the shop drawings. The maximum space between the bottom of the base plate and the top of the foundation shall be the diameter of the anchor bolt plus one inch. Place structural hardened washers on top of the base plate (one washer corresponding to each anchor bolt), and turn the first top nuts onto the anchor bolts.

7. Tighten first top nuts to a snug-tight condition in a star pattern. Snug-tight is defined as the maximum nut rotation resulting from the full effort of one person using a 12-inch long wrench or equivalent. A star tightening pattern is one in which the nuts on opposite or near-opposite sides of the bolt circle are successively tightened in a pattern resembling a star.
8. Tighten bottom leveling nuts to a snug-tight condition in a star pattern.
9. At this point, verify again if beveled washers are necessary using the criteria from step 1. If a beveled washer is required, remove the structure if necessary, add the beveled washer(s) and retighten first top nuts and bottom leveling nuts (in a star pattern) to a snug-tight condition.
10. Mark the reference position of each first top nut in a snug-tight condition with a suitable method on one flat surface of the nut with a corresponding reference mark on the base plate at each bolt before final tightening of the first top nuts. Then rotate the first top nuts incrementally to one half the required nut rotation specified in Table 1 using a star pattern until achieving. Rotate the first top nuts again, using a star pattern, to the full required nut rotation specified in Table 1. For example, if total rotation from snug tight is 1/6 turn (60°), rotate 30° in each cycle.

Table 1

Anchor Bolt Diameter, (in.)	Nut Rotation beyond Snug - Tight	
	ASTM F 1554 Grade 36 (M314)	ASTM F 1554 Grade 55 (M 314)
≤1½	1/6 turn (60°)	1/3 turn (120°)
>1½	1/12 turn (30°)	1/6 turn (60°)

Nut rotation is relative to anchor bolt. Anchor bolt nut tensioning shall not exceed plus 20°.

Unified Thread Standard (UNC) tensioning is applicable.

Lock nuts and/or split washers shall not be allowed with anchor bolts.

11. Anchor bolt connections that have been tightened shall be inspected in the presence of the Engineer by a calibrated torque wrench. The torque wrench shall be used to verify that a torque at least equal to the verification torque as provided in Table 2 is achieved. A minimum of every other bolt shall be inspected.

Table 2

Anchor Bolt Diameter, (in.)	Verification Torque	
	ASTM F 1554 Grade 36 (M314)	ASTM F 1554 Grade 55 (M 314)

	Tension/Torque kips/ft-lbs.	Tension/Torque kips/ft-lbs.
1	18 / 180	27 / 270
1 ¹ / ₄	28 / 350	44 / 550
1 ¹ / ₂	41 / 615	63 / 945
1 ³ / ₄	55 / 962	86 / 1,505
2	73 / 1,460	113 / 2,260
2 ¹ / ₄	94 / 2,115	146 / 3,285
2 ¹ / ₂	116 / 2,900	180 / 4,500
2 ³ / ₄	143 / 3,932	222 / 6,105
3	173 / 5,190	269 / 8,070
3 ¹ / ₄	206 / 6,695	320 / 10,400
3 ¹ / ₂	242 / 8,470	375 / 13,125
3 ³ / ₄	280 / 10,500	435 / 16,312
4	321 / 12,840	499 / 19,960

12. Install second top nut on each bolt to snug tight.

13. Contractor shall perform an Ultrasonic test on all anchor bolts in accordance with ASTM E114- Ultrasonic Pulse Echo Straight Beam Testing by the Contact Method. Ultrasonic testing personnel shall be qualified in accordance with ASNT SNT-TC-1A Level II and certified by VDOT Materials Division. Equipment shall be qualified in accordance with AWS D1.5 Section 6, Part C Anchor bolts shall have no indications that are above 10% Full Screen Height at the prescribed scanning level. All indications shall be noted on the report and reported to the Project Engineer and VDOT Materials Division.

Section 700.05—Measurement and Payment for Concrete foundations is replaced with the following:

Concrete foundations will be measured and paid for in units of each or cubic yards of concrete as applicable. When paid for in cubic yards of concrete, no payment will be made for concrete in excess of the cubic yards of concrete required by the foundation design unless otherwise approved by the Engineer. This price shall include foundation design, concrete, reinforcing steel, stub poles, anchor bolts, bolt circle templates, lubricant, torque, UT testing, grounding equipment, conduits, excavating, backfilling, compacting, disposing of surplus and unsuitable material, and restoring existing areas.

2-21-13 (SPCN)

SAW CUT — Section 703.04—Measurement and Payment of the Specifications is amended to replace the ninth paragraph (**Saw cuts**) with the following:

Saw cut will be measured in linear feet for the width specified and will be paid for at the contract unit price per linear foot. This price shall include cutting, cleaning, drilling, disposing of surplus material, furnishing and installing backer rods, and loop sealant material.

Pay Item

Pay Unit

Saw Cut (Width)

Linear foot

10-2-08a (SPCN)

VIRGINIA DEPARTMENT OF TRANSPORTATION
SPECIAL PROVISION FOR
TEMPORARY CONSTRUCTION AND PERMANENT PAVEMENT MARKINGS

September 28, 2012

SECTION 704—PAVEMENT MARKING AND MARKERS of the Specifications is amended as follows:

Section 704.02—Materials is amended to add the following:

- (d) **Flexible temporary pavement markers (FTPMs)** shall consist of products from the Department's current Approved List found in the Materials Division's *Manual of Instructions* (See Flexible temporary pavement marker (FTPM) or web site <http://www.virginiadot.org/business/materials-download-docs.asp>. All FTPMs shall be new product. FTPMs are suitable for use one year after the date of receipt when stored in accordance with the manufacturer's recommendations.

Section 704.03—Procedures is amended to replace the first six paragraphs with the following:

PERMANENT AND TEMPORARY PAVEMENT MARKINGS AND FLEXIBLE TEMPORARY PAVEMENT MARKERS (FTPMs)

- **Permanent pavement markings** are durable pavement markings that, when installed, provide final traffic guidance after all operations related to the project are complete in accordance with the provisions herein, Section 704 of the Specifications and as specified elsewhere in the Contract.

Permanent pavement markings shall include skip-line and solid-line centerline markings, skip-line and solid-line lane-division markings and, solid-line edge-line markings installed on the newly-placed roadways once the surface has cured.

- **Temporary construction pavement markings** are construction zone pavement markings that, when installed, provide limited-duration traffic guidance until permanent pavement markings are installed in accordance with Section 704 of the Specifications, as specified elsewhere in the Contract, and as follows:

Temporary construction pavement markings for surface treatment, slurry seal, latex emulsion treatment, and plant mix shall be:

Type F, Class I pavement markings in accordance with the provisions of Section 704 of the Specifications except with a modified application for paved surfaces. Such modification shall consist of the light application of Type F, Class I temporary traffic paint, 8 to 10 mils thick representing 75 percent of the final pavement marking width and with 3 pounds of glass beads per gallon of material.

Temporary construction pavement markings applied to planed (milled) surfaces to be overlaid shall consist of a light application of Type F, Class I temporary traffic paint 15 mils thick, representing 75 percent of the final pavement marking width and with 6 pounds of glass beads per gallon of material.

Glass beads shall conform to the requirements of Section 234 of the Specifications. Skip lines shall be applied in 8-foot lengths and approximately 32 foot gaps. Temporary Type F, Class I pavement markings shall be arranged and spaced on

their installation so as to be completely covered by the application of permanent pavement markings. Failure to place Type F, Class I temporary markings at the application rate and spacing specified herein may result in the non-payment for such markings. No eradication of such modified Type F, Class I temporary markings will be required when the Contractor installs such temporary construction pavement markings as detailed herein and such markings have been in place for no less than 3 days prior to the application of permanent pavement markings.

Temporary construction pavement markings for plant mix shall also include:

- Type D construction pavement markings in accordance with the requirements of Section 704 of the Specifications.
- **Flexible temporary pavement markers (FTPMS)** are pavement markings that the Contractor may choose to substitute for Type D or Type F, Class I pavement markings. FTPMs may be used on surface treatment, slurry seal, latex emulsion treatment, and plant mix.

FTPMS used for surface treatment, slurry seal or latex emulsion treatment operations shall include a removable material covering the reflective lens to protect the lens from being obscured or damaged by the paving operation.

The color of FTPM units and their reflective surfaces (white or yellow) shall be the same as the temporary construction pavement markings for the type of application (skip-line, solid line) they are being used in substitution.

FTPMS may be used to simulate skip-line and solid-line centerline markings and to simulate skip-line and solid-line lane-division markings (in accordance with the details furnished herein) installed on the newly-placed roadways once the surface has cured. **Please note:** Temporary edge-line markings will not be required.

Temporary construction pavement markings (and FTPMS) shall include skip-line and solid-line centerline markings, and skip-line and solid-line, lane-division line markings installed on the newly-placed roadways once the surface has cured or on milled surfaces when the time limits for unmarked pavement for the respective volumes of vehicles in Section 704 has been exceeded . **Please note:** Temporary edge-line markings will not be required.

MAINTENANCE OF TEMPORARY PAVEMENT MARKINGS AND FLEXIBLE TEMPORARY PAVEMENT MARKERS (FTPMS)

Maintenance of Temporary construction pavement markings applied to paved surfaces shall be in accordance with the following requirements:

While in place, temporary construction pavement markings sizes, shapes and retroreflectivity shall be at least minimally visible under full nighttime conditions from any point adjacent to such marking for no less than 120 feet (3 skip lines). If temporary construction pavement markings meet the requirement for this visual evaluation, no additional application (refreshing) is required. If temporary construction pavement markings are Type F, Class I and these markings do not meet this visual evaluation prior to the time limit for the application of permanent markings, such temporary markings shall be refreshed by the application of a lighter application (applied so as to enhance visibility but not as to require eradication before application of permanent markings) of Type F, Class I marking at the Contractor's expense when required by the Engineer. Under such circumstances no payment for the eradication of pavement markings will be permitted if required before the application of permanent markings. If other types of permitted temporary pavement markings are used and these fail the visual evaluation or in any other respect are

deficient prior to the time for the installation of permanent markings, these types shall be reapplied at the Contractor's expense when required by the Engineer. These requirements will apply until permanent pavement markings are installed in accordance with the time restrictions in Section 704.

FTPMS shall be installed and maintained in accordance with the manufacturer's recommendations and the requirements of the following:

The Contractor shall maintain FTPMs for the time period specified herein or until permanent pavement markings are installed in accordance with Section 704 of the Specifications. Damaged or missing FTPMs shall be replaced with new FTPMs of the same manufacturing type, color and model. No more than one FTPM may be damaged or missing out of every broken line simulated segment. No two consecutive FTPMs may be damaged or missing on a simulated solid line application, and no more than 30 percent of the FTPMs may be damaged or missing on any measured 100-foot segment of simulated solid line.

The acceptable ambient air temperature, ambient moisture condition and pavement surface condition prior to the installation of the appropriate FTPMs shall be in accordance with the manufacturer's recommendations, a copy of which shall be provided to the Engineer prior to installation.

Once applied, FTPMs will be considered for a single use. If a FTPM is removed before permanent markings are installed, it shall be replaced with a new FTPM. FTPMs may remain in place, undamaged, after installation for up to 14 consecutive days. When FTPMs are applied prior to pavement placement, such as with surface treatment, slurry seal and latex emulsion treatment, this 14 consecutive-day time limit shall begin at the time of actual installation of the FTPMs, not at the time of pavement placement completion. In no case shall any installed FTPMs be permitted to remain once time limits require permanent pavement marking installation.

PAVEMENT MARKING AND FLEXIBLE TEMPORARY PAVEMENT MARKER (FTPM) OPERATIONS

The Contractor shall have a Pavement Marking Technician, certified in accordance with the Department's Materials Certification Program for Pavement Marking, present during all pavement marking and marker operations except FTPM operations. When the Contractor chooses to substitute FTPMs for temporary construction pavement markings a certified Pavement Marking Technician will not be required for the FTPM operations.

- **Permanent Pavement Markings:** The type, class, installation procedures and time limits of permanent pavement markings shall be in accordance with the provisions specified herein and Section 704 of the Specifications.

Installation of permanent pavement marking shall not exceed the 14 calendar-day time limitation between pavement placement and completion of permanent pavement marking installation. Once permanent pavement marking operations have begun; all skip-line and solid-line centerline markings and skip-line and solid-line lane-division markings shall be completed before the operation is stopped. While the installation of edge lines will not be required during the same operation as permanent centerline and lane-division markings; edge lines shall be completed within 14 calendar days after the end of the workday when the pavement to be marked was placed.

- **Temporary construction pavement markings:** The type, class, installation procedures and time limits of temporary construction pavement markings shall be in accordance with the provisions specified herein and Section 704 of the Specifications.

Temporary construction pavement markings, including skip lines, and solid lines shall be installed at the same locations that permanent pavement markings shall be installed.

Once temporary construction pavement marking operations have begun, all skip-line and solid-line centerline markings, and skip-line and solid-line lane-division markings shall be completed before the marking operation is stopped. The installation of temporary edge-line markings will not be required.

Installation and refreshing of (as authorized by the Engineer, if necessary) temporary construction pavement markings shall not affect the 14 calendar-day time limitation between pavement placement and completion of permanent pavement marking installation.

- **Flexible temporary pavement markers (FTPMS):** The type, installation procedures and time limits for the use of FTPMS shall be in accordance with the manufacturer's recommendations, the provisions specified herein and Section 704 of the Specifications.

Prior to installing FTPMS the Contractor shall submit a plan for substituting FTPMS for temporary construction pavement markings to the Engineer for approval. The Contractor's plan for FTPMS shall be in accordance with the requirements and drawings designated as "**TYPICAL PLAN FOR FTPM PLACEMENT**" included herein.

For surface treatment, slurry seal or latex emulsion treatment operations, the appropriate FTPMS shall be installed prior to placing new pavement or treatment. Upon completion of surface treatment, slurry seal or latex emulsion treatment placement, the Contractor shall remove the protective covering from the reflective lens of the FTPM prior to leaving the work site. Failure to remove such covering may result in the non-payment for that portion type (skip or solid) of temporary pavement marking.

For plant mix operations, the appropriate FTPMS shall be installed on the newly-placed pavement after the pavement is thoroughly compacted, has cooled to the FTPMS manufacturer's recommended temperature for installation, and the surface has cured.

Prior to installing FTPMS, the pavement surface shall be free of dirt, dust, debris, moisture, oil, and any residue that may be detrimental to successful application. If such is present, the Contractor shall prepare the pavement surface by air blowing or thorough brushing.

FTPMS used to simulate skip lines and solid lines shall be installed at the same locations that permanent pavement markings shall be installed.

Once FTPM operations have begun, all skip-line and solid-line centerline markings, and skip-line and solid-line lane-division markings shall be completed before the operation is stopped. Please note: Temporary edge-line markings will not be required.

FTPMS shall be removed and properly disposed of when permanent pavement marking is required in accordance with the time limits specified herein. Used FTPMS removed from the pavement when no longer needed or permitted, including all containers, packaging, damaged FTPMS and all other miscellaneous items of waste shall be appropriately disposed of in a properly permitted waste container in accordance with applicable local, state and federal laws and regulations.

Replacement of FTPMs, required to maintain temporary marking, shall not affect the 14 calendar-day time limitation between pavement placement and completion of permanent pavement marking installation.

For newly-placed roadways, permanent pavement marking, temporary construction pavement marking or FTPM installation shall be completed in accordance with the time limits specified below unless otherwise directed by the Engineer. Exceptions to the below time limits will be granted only for weather restrictions and for installation of Type B, Class VI and epoxy resin pavement markings on plant mix roadways. Installation of Type B, Class VI, pavement markings on plant mix roadways are not applicable to these requirements if they are inlaid with the last pass of the asphalt roller or directly after the asphalt roller using a separate roller. Installation of epoxy resin pavement markings on newly placed plant mix pavement shall not commence until after 24 hours of final surface placement.

PERMANENT PAVEMENT MARKINGS, TEMPORARY CONSTRUCTION PAVEMENT MARKINGS AND FLEXIBLE TEMPORARY PAVEMENT MARKERS (FTPMS) INSTALLATION TIME LIMITS ON ROADWAYS OPEN TO TRAFFIC:

Surface Treatment Operations

The Contractor shall maintain temporary construction pavement markings until the permanent pavement markings are installed. The Contractor shall sweep surface treated roadways prior to installation of permanent pavement markings as directed by the Engineer but no earlier than 7 days after completion of surface treatment placement. Permanent pavement marking installation shall be completed after sweeping but within 14 calendar days after the end of the workday when the surface treatment pavement surface to be marked was placed.

The following governs the installation time limits for temporary construction markings or FTPMs:

- **Roads having traffic volumes of 10,000 ADT or more:** Temporary construction pavement markings shall be installed within 24 hours after the end of the workday the unmarked new surface treatment is placed, and maintained until the permanent pavement markings are installed. If FTPMs are used they shall be installed prior to placement of surface treatment.
- **Roads having traffic volumes between 3,000 and 10,000 ADT:** Temporary construction pavement markings shall be installed within 48 hours after the end of the workday the unmarked new surface treatment is placed, and maintained until the permanent pavement markings are installed. If FTPMs are used they shall be installed prior to placement of surface treatment.
- **Roads having traffic volumes of 3,000 ADT or less:** Temporary construction pavement markings or FTPMs will not be required unless determined and authorized by the Engineer to be necessary to ensure the safety of the traveling public. If the Engineer requires FTPMs, such markers shall be installed prior to placement of surface treatment.

Slurry Seal or Latex Emulsion Treatment Operations

Permanent pavement marking installation shall be completed within 14 calendar days after the end of the workday when the slurry seal or latex emulsion treatment pavement surface to be marked was placed.

The following governs the installation time limits for temporary construction markings or FTPMs. The Contractor shall maintain temporary construction pavement markings until the permanent pavement markings are installed:

- **Roads having traffic volumes of 10,000 ADT or more:** Temporary construction pavement markings shall be installed within 24 hours after the end of the workday the unmarked new slurry seal or latex emulsion is placed, and maintained until the permanent pavement markings are installed. If FTPMs are used they shall be installed prior to placement of slurry seal or latex emulsion treatment.
- **Roads having traffic volumes between 3,000 and 10,000 ADT:** Temporary construction pavement markings shall be installed within 48 hours after the end of the workday the unmarked new slurry seal or latex emulsion is placed, and maintained until the permanent pavement markings are installed. If FTPMs are used they shall be installed prior to placement of slurry seal or latex emulsion treatment. .
- **Roads having traffic volumes of 3,000 ADT or less:** Temporary construction pavement markings shall be installed within 72 hours after the end of the workday the unmarked new slurry seal or latex emulsion is placed, and maintained until the permanent pavement markings are installed. If FTPMs are used they shall be installed prior to placement of slurry seal or latex emulsion treatment.

Plant Mix Operations

Prior to the end of the workday the Contractor shall determine whether permanent pavement markings can be installed within 24 hours after the end of the workday. If the Contractor determines that permanent pavement markings can be installed within such time limits, the permanent pavement markings shall be installed. If the Contractor determines that permanent pavement markings cannot be installed within such time limits he shall install and maintain temporary construction pavement markings or FTPMs until the permanent pavement markings are installed. **Permanent pavement marking installation shall be completed within 14 calendar days after the end of the workday when the plant mix pavement surface to be marked was placed.**

- **Roads having traffic volumes of 10,000 ADT or more:** Permanent pavement markings, temporary construction pavement markings or FTPMs shall be installed within 24 hours after the end of the workday the unmarked plant mix is placed.
- **Roads having traffic volumes between 3,000 and 10,000 ADT:** Permanent pavement markings, temporary construction pavement markings or FTPMs shall be installed within 48 hours after the end of the workday the unmarked plant mix is placed.
- **Roads having traffic volumes of 3,000 ADT or less:** Permanent pavement markings, temporary construction pavement markings or FTPMs shall be installed within 72 hours after the end of the workday the unmarked plant mix is placed.

Section 704.04—Measurement and Payment is amended to add the following:

Permanent pavement markings will be measured and paid for as the appropriate pavement line marking or pavement message marking pay items and pay units specified in the Contract. For roadways that are surface treated, the cost of sweeping the roadway prior to installing permanent pavement markings shall be included in the price bid for such pavement line or message marking items.

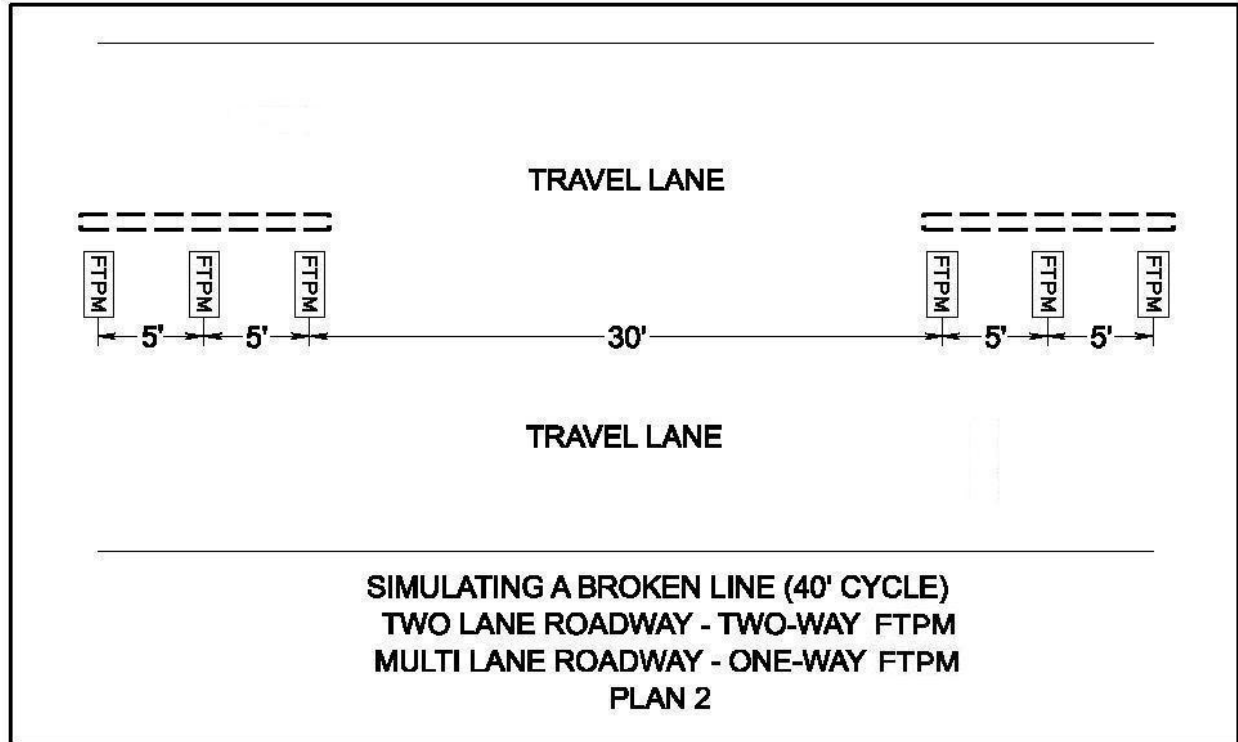
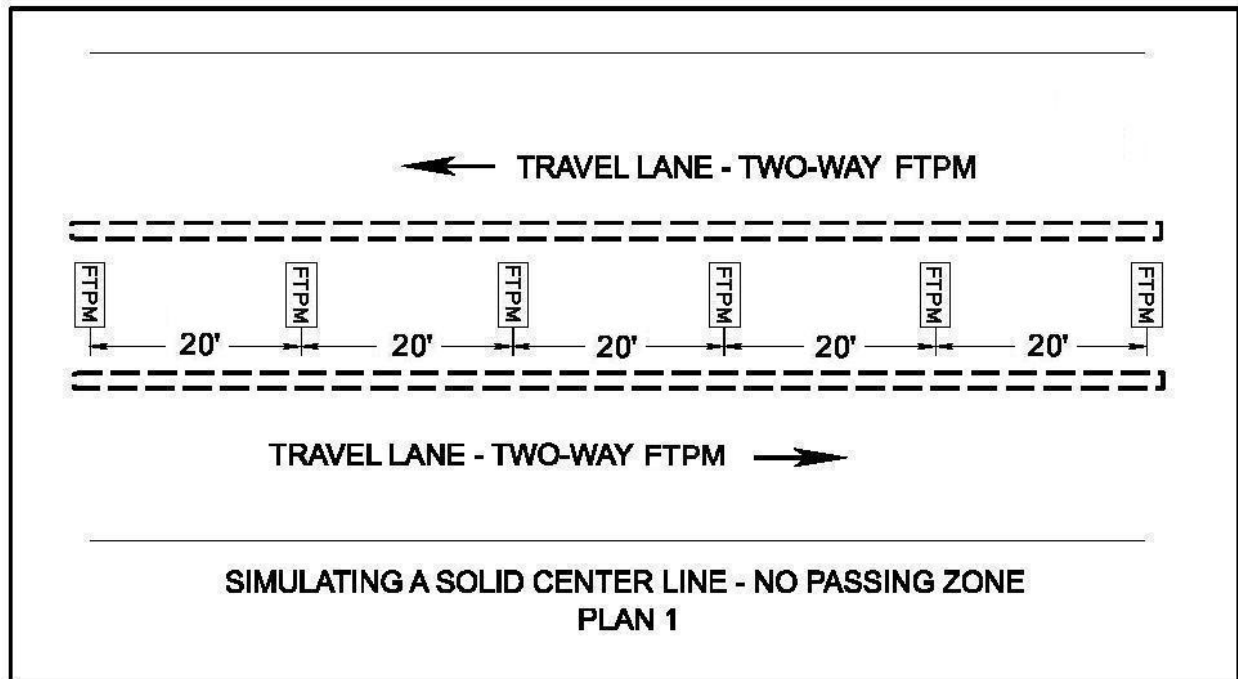
Temporary construction pavement markings, including **flexible temporary pavement markers (FTPMS)** used in substitution of temporary construction pavement markings, will be measured and paid for at the contract unit price per linear foot for the appropriate pavement line marking pay items and pay units specified in the Contract. Where FTPMs are used to simulate skip-line and solid-line centerline markings and skip-line and solid-line lane-division markings, the linear foot pay unit shall represent all FTPMs required in accordance **TYPICAL PLAN FOR FTPM PLACEMENT** and the requirements herein to simulate that solid or skip line temporary construction line marking. This cost shall include furnishing and application of the temporary construction pavement markings or FTPMs, surface preparation, furnishing, installing and maintaining temporary construction pavement markings (or FTPMs) for the entire 14 calendar day time limit.

Please note: Quantities for temporary construction markings listed in the contract are based on one cycle of marking for the 14 day time limitation before permanent markings must be installed. If temporary markings require refreshing or reapplication before the expiration of the 14 day time limit for the application of permanent markings, refreshing or reapplication shall be at the Contractor's expense. Such prices shall also include quality control daily logs, traffic control and all materials, labor, equipment and incidentals.

Payment will be made under:

Pay Item	Pay Unit
Temporary construction pavement markings and (FTPMS)	Linear Foot
Temporary construction pavement markings	Square Foot

TYPICAL PLAN FOR FTPM PLACEMENT



VIRGINIA DEPARTMENT OF TRANSPORTATION
2007 ROAD AND BRIDGE SUPPLEMENTAL SPECIFICATIONS

SUPPLEMENTAL SECTION 700—GENERAL

SECTION 700—GENERAL of the Specifications is amended as follows:

Section 700.02(i) the first sentence is replaced with the following:

Poles, posts, and overhead sign structures shall conform to the following:

Section 700.02(i)2. is replaced with the following:

2. **Overhead sign structures, signal poles (mast arm and strain), and high-mast lighting poles** shall be steel.

Section 700.02(i)4. Poles, posts, and overhead sign structures is replaced with the following:

4. **Sign posts** shall be wood or steel. Square tube post shall be hot-rolled, carbon sheet steel, structural steel quality, conforming to the requirements of ASTM A 1011, Grade 50 except the yield strength after cold-forming shall be 60,000-psi minimum. Steel mounting brackets shall conform to the requirements of ASTM A36. Posts (inside and outside) shall be galvanized in accordance with the requirements of ASTM A653, Coating Designation G-90.

Section 700.02(i) the first and second paragraph is replaced with the following:

Lighting, signal, pedestal poles; sign posts; and overhead sign structures not designed to support variable message signs shall conform to the requirements of the 1994 Edition of AASHTO's *Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals*.

Overhead sign structures, including "butterfly" structures, designed to support variable message signs shall conform to the requirements of the 2001 Edition of AASHTO's *Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals* and the following clarifications:

- Basic wind speed shall be used in the designs. The alternate method for wind pressures provided in Appendix C shall not be used.
- When the installation location of the structures lies between isotachs, the basic wind speed shall be determined by using the higher adjacent isotach.
- Any optional design parameters indicated in the AASHTO specification that are "allowed when acceptable to the owner" shall not be used for the designs.

Steel poles, posts, and overhead sign structures shall be hot-dip galvanized after fabrication. Except when shop painting is required, steel poles and posts shall be given one shop coat of primer and two field coats of paint and the galvanization finish of overhead sign structures shall be field treated for paint retention and two coats of paint applied.

Section 700.04(a)1. Grounding Electrodes is amended to replace the seventh paragraph with the following:

- The Contractor shall install a junction box at the primary grounding electrode location for access to the electrode for connection and testing. Grounding electrode conductors shall

be installed under the bottom flange of the junction box. The grounding electrode shall be centered in the bottom of the junction box with a minimum of 6 inches exposed. The junction box cover shall have the letters "VDOT ELEC" cast in the depression on the top.

Section 700.04(a)2. Grounding electrode testing is replaced with the following:

2. **Grounding electrode testing:** Primary grounding electrodes shall be tested after each 10-foot grounding electrode and/or section thereof is installed using the fall of potential (three-point measurement) method. After the primary grounding electrode is installed and tested, the Contractor shall connect to the augmented electrode(s) to conduct a system test. The Contractor shall disconnect the grounding electrode conductor from the service equipment ground bus and bonding bushing before testing the grounding electrodes/system. The Contractor shall test the grounding electrode as required by the manufacturer's instructions for the type of earth testing equipment. The Contractor shall record the readings on a form provided by the Regional Traffic Engineering Office. The completed form shall be signed and submitted to the Engineer after installation of the electrical service grounding.

Section 700.04(e) Poles, Posts, and Sign Structures is amended to include the following:

Square tube sign post shall have 7/16-inch (+/- 1/64-inch) openings or knockouts spaced 1-inch on centers on all four sides. When specified on the plans a 2 3/16-inch inner-post shall be used with the 2 1/2-inch post for additional strength. The inner-post shall be no less than 6 feet long.

Where posts are to be mounted on a retaining wall or barrier, the Contractor shall provide a mounting bracket, fabricated from steel conforming to the requirements of ASTM A36 and hot dipped galvanized in accordance with ASTM A123. Mounting bracket shall be designed so no connection to the barrier is made on the traffic side of the barrier and shall be secured to the barrier and wall using stainless steel chemically adhesive anchors.

Section 700.04(g)1. Electrical service and lighting conductor identification is amended to replace the fifth paragraph with the following:

Color-coding shall be as follows:

2-wire circuits, 120 Volts; 3-wire circuits, 120/240 Volts; 3-phase, 4-wire wye circuits, 208/120 Volts and; 3-phase, 4-wire delta circuits, 240 Volts

Circuit Designation	Color Code
Phase A or Line A	Black
Phase B or Line B	Red or orange*
Phase C	Blue
Grounded Conductor (Neutral)	White or gray** (see exception above)
Equipment Grounding Conductor	Bare, green, or green with one/more yellow stripes

3-phase, 4-wire wye circuits, 480/277 Volts; 3-phase, 3-wire delta circuits, 480 volts

Circuit Designation	Color Code
Phase A	Brown
Phase B	Orange
Phase C	Yellow
Grounded Conductor (Neutral)	White or gray** (see exception above)
Equipment Grounding Conductor	Bare, green, or green with one/more yellow stripes

- * For 3-phase, 4-wire delta circuits, Phase B shall be the high leg and shall be orange.
- ** For outer covering of conductors of different systems that is contained within the same enclosure, refer to Article 200 of the NEC.

Section 700.04(h) Conduit Systems is amended to include the following:

When a conduit enters a box, fitting, or other enclosure, a bushing shall be provided to protect the conductor cable from abrasion unless the design of the box, fitting, or enclosure is such to afford equivalent protection of the conductor cable.

Section 700.04(h)2. Buried conduit systems is amended to replace the second paragraph with the following:

When conduit is to be installed under an existing roadway, entrance, or fixed object and open cutting is not permitted, conduit shall be installed by an approved directional boring method. Conduit for the directional boring method shall be PVC designed specifically for the directional boring operation or high-density PE. When the plans show more than one conduit at a location to be installed by directional boring, with the Engineers approval the Contractor may elect to install multiple conduits into a single bore at no additional cost to the Department.

MAXIMUM PILOT OR BACK REAMER BIT DIAMETER WHEN ROATED 360⁰	
NOMINAL INSIDE PIPE DIAMETER INCHES	BIT (REAMER) DIAMETER INCHES
1 - 2"	4" BORE HOLE
2 - 2"	5" BORE HOLE
3 - 2"	8" BORE HOLE
1 - 3"	5" BORE HOLE
2 - 3"	6 ½ " BORE HOLE
3 - 3"	8" BORE HOLE
1 - 4"	6 ½ " BORE HOLE

The Contractor shall use an approved stabilizing agent mixed with potable water to create the drilling fluid (mud slurry) for lubrication and soil stabilization. The fluid viscosity may vary to best fit the soil conditions encountered. Do not use any chemicals or polymer surfactants in the drilling fluid without written consent from the Engineer. The Contractor shall certify to the Engineer in writing that any chemical added to the drilling fluid is environmentally safe and not harmful or corrosive to the conduit system.

The Contractor may elect to use the jacked method to install a pipe sleeve for installation of the required conduit at no additional cost to the Department.

If an obstruction is encountered during the directional boring or jacking operation that requires abandonment of the hole (tunnel), it shall be backfilled with a flowable fill immediately, at no additional cost to the Department.

Section 700.04(i) Junction Box Covers is replaced with the following:

(i) **Junction Boxes** shall be installed as follows:

The junction box site shall be excavated such that the depth of the excavation shall be the height of the junction box plus at least twelve inches to allow for bedding aggregate material and such that the width shall be six to eight inches wider than the junction box.

Bedding material shall be No. 68, No. 78, or No. 8 aggregate or Crushed Glass conforming to No. 78, or No. 8 gradation requirements. Aggregate shall be a minimum of twelve inches in depth and entirely cover the bottom of the junction box excavation. The bedding aggregate shall be leveled and tamped prior to installing the junction box.

Junction box shall be installed and leveled to grade prior to backfilling.

Prior to backfilling the interior of polymer concrete junction boxes (JB-S1, JB-S2 and JB-S3) shall be braced with 2 inch by 4 inch lumber using two braces across the width and one brace across the length of the box or as required by the manufacturer. Bracing shall be installed to facilitate removal once back filling and compaction have been completed. The Contractor shall remove internal bracing after the backfilling and compacting operation has been completed.

The cover of the junction box shall be installed prior to backfilling.

The junction box shall be backfilled and compacted around its perimeter utilizing six to eight inch horizontal lifts to where the concrete collar is to begin. Once the concrete collar has cured the remaining area around the collar shall be backfilled and compacted as stated above. Compaction shall be at least ninety percent of the theoretical maximum density as defined in Section 101.02 of the Specifications. A mechanical tamping device shall be used to compact the backfill and soil layer by layer around the perimeter of the junction box. The wheel of a backhoe or other type vehicle shall not be used for compaction of backfill and soil. The internal bracing shall be removed after backfilling and compaction has been completed. The area around the junction box shall be graded and restored as stated in the Specifications.

Junction boxes shall not be installed or backfilled in standing water. Backfill material shall be free of large stones, wood or other debris and shall not be saturated with water.

If a special tool or wrench is required to remove the cover, the Contractor shall furnish the Engineer with five such tools.

Section 700.04—Procedures is amended to include the following:

(k) Anchor Bolts

Traffic control device foundations shall have a bolt template positioned for correct orientation of the structure with respect to the structure location and roadway alignment and to maintain the anchor bolts vertical (plumb) and level during construction.

Bolt and/or anchor nut covers shall not be installed on any traffic control device structures, unless otherwise specified on the plans.

Anchor bolts in double-nut connections shall extend a minimum of $\frac{1}{4}$ " past the second top nut.

The threaded portion of the anchor bolts shall be lubricated with beeswax, the bolt manufacturer's recommended lubricant, or other lubricant as approved by the Engineer for proper tensioning before the structure is installed.

Double-nut connections installation procedure: (A minimum of three nuts and two hardened washers shall be provided for each anchor bolt.)

1. If bolt(s) are not plumb (vertical), determine if beveled washer(s) may be required prior to erection of the structure. Beveled washers shall be used on top of the leveling nut

and/or under the first top nut if any face of the base plate has a slope greater than 1:20 and/or any nut could not be brought into firm contact with the base plate.

2. Clean and lubricate the exposed thread of all anchor bolts, nuts and all bearing surfaces of all leveling nuts. Re-lubricate the exposed threads of the anchor bolts and the threads of the nuts if more than 24 hours has elapsed since earlier lubrication, or if the anchor bolts and nuts have become wet since they were first lubricated.
3. Verify that the nuts can be turned onto the bolts the full length of the threads by hand.
4. Turn the leveling nuts onto the anchor bolts and align the nuts to the required elevation shown on the shop drawings. The maximum distance between the bottom of the leveling nut and the top of the foundation shall be one inch.
5. Place structural hardened washers on top of the leveling nuts (one washer corresponding to each anchor bolt).
6. The post or end frame shall be plumbed or aligned as shown on the shop drawings. The maximum space between the bottom of the base plate and the top of the foundation shall be the diameter of the anchor bolt plus one inch. Place structural hardened washers on top of the base plate (one washer corresponding to each anchor bolt), and turn the first top nuts onto the anchor bolts.
7. Tighten first top nuts to a snug-tight condition in a star pattern. Snug-tight is defined as the maximum nut rotation resulting from the full effort of one person using a 12-inch long wrench or equivalent. A star tightening pattern is one in which the nuts on opposite or near-opposite sides of the bolt circle are successively tightened in a pattern resembling a star.
8. Tighten bottom leveling nuts to a snug-tight condition in a star pattern.
9. At this point, verify again if beveled washers are necessary using the criteria from step 1. If a beveled washer is required, remove the structure if necessary, add the beveled washer(s) and retighten first top nuts and bottom leveling nuts (in a star pattern) to a snug-tight condition.
10. Mark the reference position of each first top nut in a snug-tight condition with a suitable method on one flat surface of the nut with a corresponding reference mark on the base plate at each bolt before final tightening of the first top nuts. Then rotate the first top nuts incrementally to one half the required nut rotation specified in Table 1 using a star pattern until achieving. Rotate the first top nuts again, using a star pattern, to the full required nut rotation specified in Table 1. For example, if total rotation from snug tight is 1/6 turn (60°), rotate 30° in each cycle.

Table 1

Anchor Bolt Diameter, (in.)	Nut Rotation beyond Snug - Tight	
	ASTM F 1554 Grade 36 (M314)	ASTM F 1554 Grade 55 (M 314)
≤1½	1/6 turn (60°)	1/3 turn (120°)
>1½	1/12 turn (30°)	1/6 turn (60°)

Nut rotation is relative to anchor bolt. Anchor bolt nut tensioning shall not exceed plus 20°.

Unified Thread Standard (UNC) tensioning is applicable.

Lock nuts and/or split washers shall not be allowed with anchor bolts.

11. Anchor bolt connections that have been tightened shall be inspected in the presence of the Engineer by a calibrated torque wrench. The torque wrench shall be used to verify that a torque at least equal to the verification torque as provided in Table 2 is achieved. A minimum of every other bolt shall be inspected.

Table 2

Anchor Bolt Diameter, (in.)	Verification Torque	
	ASTM F 1554 Grade 36 (M314) Tension/Torque kips/ft-lbs.	ASTM F 1554 Grade 55 (M 314) Tension/Torque kips/ft-lbs.
1	18 / 180	27 / 270
1 1/4	28 / 350	44 / 550
1 1/2	41 / 615	63 / 945
1 3/4	55 / 962	86 / 1,505
2	73 / 1,460	113 / 2,260
2 1/4	94 / 2,115	146 / 3,285
2 1/2	116 / 2,900	180 / 4,500
2 3/4	143 / 3,932	222 / 6,105
3	173 / 5,190	269 / 8,070
3 1/4	206 / 6,695	320 / 10,400
3 1/2	242 / 8,470	375 / 13,125
3 3/4	280 / 10,500	435 / 16,312
4	321 / 12,840	499 / 19,960

12. Install second top nut on each bolt to snug tight.
13. Contractor shall perform an Ultrasonic test on all anchor bolts in accordance with ASTM E114- Ultrasonic Pulse Echo Straight Beam Testing by the Contact Method. Ultrasonic testing personnel shall be qualified in accordance with ASNT SNT-TC-1A Level II and certified by VDOT Materials Division. Equipment shall be qualified in accordance with AWS D1.5 Section 6, Part C. Anchor bolts shall have no indications that are above 10% Full Screen Height at the prescribed scanning level. All indications shall be noted on the report and reported to the Project Engineer and VDOT Materials Division.

Section 700.05—Measurement and Payment for Concrete foundations is replaced with the following:

Concrete foundations will be measured and paid for in units of each or cubic yards of concrete as applicable. When paid for in cubic yards of concrete, no payment will be made for concrete in excess of the cubic yards of concrete required by the foundation design unless otherwise approved by the Engineer. This price shall include foundation design, concrete, reinforcing steel, stub poles, anchor bolts, bolt circle templates, lubricant, torque, UT testing, grounding equipment,

conduits, excavating, backfilling, compacting, disposing of surplus and unsuitable material, and restoring existing areas.

Section 700.05—Measurement and Payment for Overhead and bridge-mounted sign structures is replaced with the following:

Overhead sign structures will be measured in units of each and will be paid for at the contract unit price per each. This price shall include structural units and supports, hand holes and covers, grounding lugs, electrical systems including conduit and fittings, and identification tags.

Section 700.05—Measurement and Payment for, Junction boxes is replaced with the following:

Junction boxes will be measured in units of each and will be paid for at the contract unit price per each. This price shall include concrete collars, frames and covers, tools to remove the cover, ground rods, ground conductors, grounding lugs, knockouts, cable racks, bracing, aggregate, excavating, backfilling, compacting, disposing of surplus and unsuitable material, and restoring existing areas.

VIRGINIA DEPARTMENT OF TRANSPORTATION
2007 ROAD AND BRIDGE SUPPLEMENTAL SPECIFICATIONS

SUPPLEMENTAL SECTION 701—TRAFFIC SIGNS

SECTION 701—TRAFFIC SIGNS of the Specifications is amended as follows:

Section 701.03—Procedures is amended as follows:

Section 701.03(a)2. Sign panels is amended to include the following:

Extruded sign panels shall be in accordance with the drawings and Section 229.02(c) of the Specifications.

Section 701.03(d) Erection is amended to replace the first sentence of the first paragraph with the following:

Vertical clearance for overhead sign structures shall be no less than 19 feet 0 inch and no more than 21 feet 0 inch from the bottom of the lowest mounted sign panel to the crown of the roadway unless otherwise specified on the plans

Section 701.03(d) Erection is amended to delete the last sentence of the first paragraph:

Section 701.03(d) Erection is amended to delete the last paragraph:

Section 701.03(d) Erection is amended to include the following:

Overlay panels shall be preformed on a flat surface with no protruding bolts or bolt heads on the existing sign panel.

Overlay of overhead sign panels shall be in accordance with the plan details.

VIRGINIA DEPARTMENT OF TRANSPORTATION
2007 ROAD AND BRIDGE SUPPLEMENTAL SPECIFICATIONS

SUPPLEMENTAL SECTION 703—TRAFFIC SIGNALS

SECTION 703—TRAFFIC SIGNALS of the Specifications is amended as follows:

Section 703.02—Equipment is amended as follows:

Section 703.02(g)—Detectors is amended to delete 1. Magnetic detectors and 2. Magnetic detector amplifiers.

Section 703.03—Procedures is amended as follows:

Section 703.03(e) Installing signal heads is amended to replace the last sentence of the second paragraph with the following:

Joints shall be rendered weatherproof by an approved method.

Section 703.03(g)1.—Magnetic Detectors is deleted.

Section 703.04—Measurement and Payment is amended as follows:

Section 703.04—Measurement and Payment is amended to delete the sixth paragraph, **Magnetic detector sensing elements** and the fourteenth paragraph, **Cable terminal enclosures**.

Section 703.04—Measurement and Payment is amended to include the following:

Pedestrian actuation will be measured in units of each and will be paid for at the contract unit price per each. This price shall include pedestrian pushbutton, fittings, sign(s), conduit, conduit when required, supplementary grounding electrode, grounding conductor, and concrete foundation when required.

Flashing beacon will be measured in units of each and will be paid for at the contract unit price per each. This price shall include galvanized post, conduit, concrete foundation, grounding electrode, ground conductor, signal heads, breakaway connectors, sign panels and mounting hardware.

Payment will be made under:

Pay Item	Pay Unit
Pedestrian actuation (Standard)	Each
Flashing beacon (Standard)	Each

VIRGINIA DEPARTMENT OF TRANSPORTATION
2007 ROAD AND BRIDGE SUPPLEMENTAL SPECIFICATIONS

SUPPLEMENTAL SECTION 704—PAVEMENT MARKINGS AND MARKERS

SECTION 704—PAVEMENT MARKINGS AND MARKERS of the Specifications is amended as follows:

TABLE VII-1 PAVEMENT MARKINGS is replaced with the following:

**TABLE VII-1
Pavement Markings**

Type	Class	Name	Surface Temp. at Time of Application	Film Thickness (mils)	Pavement Surface	Application Limitations
A		Traffic paint	50°F+	15 ± 1 when wet	AC HCC	May be applied directly after paving operations
B	I	Thermoplastic Alkyd	50°F+	90 ± 5 when set	AC	May be applied directly after paving operations
	I	Thermoplastic Hydrocarbon	50°F+	90 ± 5 when set	AC	Do not apply less than 30 days after paving operations
	II	Preformed Thermoplastic	50°F+	120-130	AC HCC	Manufacturer's recommendations
	III	Epoxy resin	50°F+	20 ± 1 when wet	AC HCC	Pavement surface needs to be at least 1 day old
	IV	Plastic-backed preformed Tape	(Note 1)	60 - 90	AC HCC	Manufacturer's recommendations
	VI	Profiled preformed Tape	(Note 1)	(Note 1)	AC HCC	Manufacturer's recommendations
	VII	Polyurea	(Note 1)	20 ± 1 when wet	AC HCC	Manufacturer's recommendations
D	I & II	Removable tape	(Note 1)	(Note 1)	AC HCC	Construction zone pavement marking
E		Removable Black tape (Non-Reflective)	(Note 1)	(Note 1)	AC	Construction zone pavement marking for covering existing markings
F	I & II	Temporary markings	(Note 1)	40 max	AC HCC	Construction zone pavement marking

Note 1: In accordance with manufacturer's recommendation.

VIRGINIA DEPARTMENT OF TRANSPORTATION
SPECIAL PROVISION
PREFORMED THERMOPLASTIC PAVEMENT MARKINGS

November 29, 2011b

I. DESCRIPTION

These specifications provide criteria for furnishing and installing durable, retroreflective preformed thermoplastic material for use in installing pavement markings, message markings and pavement marker applications. Lines, legends and symbol material shall be capable of being affixed (fusing) to asphalt concrete (bituminous) pavements by the use of a heating source.

II. DETAIL REQUIREMENTS

Preformed thermoplastic marking materials shall be in accordance with the Department's [approved products list](#).

Material shall be a preformed, beaded reflectorized thermoplastic pavement marking material that is applied to the road surface using a heat source such as a propane torch. Upon cooling to normal pavement temperature, the material shall produce a reflectorized message, legend or symbol of specified thickness, width or design capable of resisting deformation to traffic. Material shall not distort because of temperature variations prior to application. The Contractor shall ensure that the pavement surface is clean, dry and free of debris or other deleterious material which may affect performance by removing all dust, dirt, loose particles heavy oil residues and other deleterious materials that may affect proper installation. Manufacturer\Supplier must enclose application instructions (multilingual) in with each box/package of materials.

Material shall be suitable for use on asphalt concrete surfaces and shall be capable of being applied to previously applied pavement marking material of the same composition under normal conditions of use. Marking material must be capable of conforming to pavement contours, breaks and faults through the action of traffic within the range of temperatures as specified herein. The markings shall have resealing characteristics, such that it is capable of fusing with itself and previously applied thermoplastic when heated with the heat source. In addition to being capable of fusing itself over existing markings such new markings shall be furnished to match the size dimensions and shape of existing markings.

Material shall not exude fumes that are toxic or injurious to persons, animals or property when heated to the application temperature.

Material shall withstand air and roadway temperature variations from 0 degrees F to 140 degrees F without deforming, bleeding, staining, discoloring and shall maintain their original dimensions and placement without chipping, spalling, or cracking. Material shall not deteriorate because of contact with sodium chloride, calcium chloride, mild alkalies and acids, or other ice control material; oil in the pavement material; or oil and gasoline drippings from vehicles.

Material, except for reversible arrows, shall have factory applied coated surface and intermixed beads. Intermixed beads shall be uniformly distributed throughout the material at a minimum of 30 percent by weight. Reversible arrows shall have intermixed beads only. Surface beads for reversible arrows shall conform to the requirements of Section 234 and be furnished and applied by the installer.

Initial skid resistance value shall be at least 45 BPN when tested in accordance with ASTM E 303.

Retained retroreflectivity, durability and color of markings shall conform to the following requirements after being installed on a northern region test deck for one year.

Retroreflectivity: Photometric quantity to be measured is coefficient of retroreflected luminance (R_L) in accordance with the requirements of ASTM E 1710. R_L shall be expressed in millicandelas per square foot per foot per foot-candle and shall be at least the following values when measured in the wheel path area.

	Initial	Retained (after 1 Year)
White	300	90
Yellow	200	70

Durability: Material shall have a durability rating of at least 4 when determined in the wheel path area.

Retained Daytime Color: Retained daytime color of markings shall conform to the requirements of ASTM D 6628.

Initial Nighttime Color: Initial nighttime color of preformed thermoplastic plastic pavement marking material shall conform to the following CIE chromaticity coordinate requirements when tested in accordance with VTM 111.

CIE CHROMATICITY COORDINATE LIMITS (INITIAL WITH DROP-ON BEADS)								
Color	1		2		3		4	
	x	y	x	y	x	y	x	y
Yellow	0.486	0.439	0.520	0.480	0.560	0.440	0.498	0.426

Material shall not be formulated with any compounds of the heavy metals listed in 40 CFR 261.24 Table 1 except that barium sulfate is allowed. Total heavy metal levels, with the exception of barium sulfate, shall not exceed 20 times the specified regulatory limits.

Amount and type of yellow pigment and inert filler for yellow material shall be at the option of the manufacturer provided the material complies with all other requirements of this specification.

Material to be supplied may be of either of the following types:

- Type where the manufacturer requires preheating of the roadway surface to a specified temperature prior to installation of the preformed thermoplastic material.
- Type where the manufacturer requires preheating of the roadway surface prior to installation of the preformed thermoplastic material to only remove moisture when necessary.

Current manufacturer installation instructions will be used to determine which type material a manufacturer produces. A copy of the instructions shall be provided to the Engineer.

When installing over existing thermoplastic markings new preformed thermoplastic pavement markings shall conform to the shape and completely adhere (fuse) to the old existing markings. Materials on this list determined not to conform to these requirements based on this verification testing will not be acceptable.

Materials failing any of the requirements of this provision will be deemed unacceptable and the Contractor shall then furnish acceptable materials meeting these requirements at no additional cost to the contract.

III. DESIGN APPLICATIONS

Crosswalks and stop lines shall be installed using preformed thermoplastic pavement markings conforming to the details and dimensions of the contract. Crosswalk lines shall be one foot wide and stop lines shall be two feet in width.

Pavement message markings and symbols shall be installed using preformed thermoplastic pavement markings conforming to the designs and dimensions detailed in the contract.

IV. MEASUREMENT AND PAYMENT

Preformed thermoplastic pavement marking will be measured in linear feet or each depending on the configuration of the message marking (linear, message or symbol) as designated in the contract and will be paid for at the contract unit price per linear foot or each as specified by the individual message marking. This price shall include furnishing pavement marking material, message or symbol, surface preparation, primer-sealer, additional surface glass beads, installation, daily log (Form C-85), guarding devices, or other incidentals recommended for installation by the manufacturer.

Payment will be made under:

Pay Item	Pay Unit
Preformed (width) Thermoplastic	Linear foot or Each

— **PROJECT SPECIFIC PROVISIONS AND STANDARD
SPECIFICATION MODIFICATIONS** —

VIRGINIA DEPARTMENT OF TRANSPORTATION
SPECIAL PROVISION FOR
AGGREGATE REINFORCED THERMOPLASTIC PAVEMENT MARKING

April 1, 2014

I. DESCRIPTION

This work shall consist of furnishing and placing a durable imprinted aggregate reinforced preformed thermoplastic pavement marking system (herein "System") that provides a textured, highly attractive and durable topical treatment to the surface of asphalt pavement. Typically the system replicates, in relief, the grout lines common to brick or other types of unit pavers, but may also be used to create other patterns. It is intended for use on asphalt pavements to create traffic calming solutions and decorative crosswalks, medians, intersections, and through areas in parking lots. It provides a seamless, aesthetic look without the trip hazards and ongoing maintenance often associated with paver and stamped concrete.

II. MATERIALS

Materials for **aggregate reinforced thermoplastic pavement marking** shall conform to the requirements set forth in this special provision.

Aggregate reinforced thermoplastic pavement marking material must be composed of an ester modified rosin impervious to degradation by motor fuels, lubricants, etc. in conjunction with aggregates, pigments, binders, and anti-skid/anti-slip elements. Pigments and anti-skid/anti-slip elements must be uniformly distributed throughout the material. The material conforms to AASHTO designation M249, with the exception of the relevant differences due to the material being supplied in a preformed state, being non-reflective, and potentially being of a color different from white or yellow.

The pigment system must not contain heavy metals nor any carcinogen, as defined in 29 CFR 1910.1200 in amounts exceeding permissible limits as specified in relevant Federal Regulations.

The surface of the material shall contain factory applied anti-skid/anti-slip elements with a minimum hardness of 6 (Mohs scale). Upon application the material shall provide a minimum skid resistance value of 60 BPN when tested according to ASTM E 303.

The surface of the material shall contain factory applied anti-skid/anti-slip elements with a minimum hardness of 6 (Mohs scale). Upon application the material shall provide a minimum static friction of coefficient of 0.6 when tested according to ASTM C 1028 (wet and dry), and a minimum static coefficient of friction of 0.6 when tested according to ASTM D 2047.

The material must be supplied at a minimum thickness of 150 mil (3.8mm).

The material must be resistant to deterioration due to exposure to sunlight, water, salt, or adverse weather conditions and impervious to oil and gasoline.

The material may be stored for 12 months, if stored indoors and protected from the elements.

Acceptable products include:

- 1.) TrafficPatternsXD
Ennis-Flint
<http://www.ennisflint.com/Products/TrafficScapes/TrafficPatternsXD>
- 2.) Approved Equal

III. PROCEDURES

The System shall be supplied and applied only by an applicator certified by the System manufacturer. The applicator shall provide proof of current certification before commencing work. The Certified Applicator shall follow the System manufacturer's current published application procedures.

The system must only be applied to a stable, high quality asphalt pavement substrate over a stable base that is free of defects, as per the manufacturer published Substrate Guide. The asphalt pavement surface shall be dry and free from all foreign matter, including but not limited to dirt, dust, de-icing materials, and chemical residue.

The System is applied to asphalt pavement using proprietary reciprocating infrared heating equipment. The material must be able to be applied at ambient and road temperatures down to 45 degrees Fahrenheit (7 degrees Celsius) without any preheating of the pavement to a specific temperature. A two-part epoxy sealer specified by the manufacturer must be applied to the substrate prior to preformed thermoplastic application. Immediately following sealer application, the panes of aggregate reinforced preformed thermoplastic are position properly on the asphalt substrate with the aggregate side facing up. The preformed thermoplastic is then heated to the required melting temperature. Additional aggregate may be applied to the preformed thermoplastic surface as needed following the melting process. As the material is cooling, it is imprinted with a stamping template made from 3/8 in. (9.5 mm) flexible wire rope in the required design using a vibratory plate compactor. The preformed thermoplastic material is then allowed to cool thoroughly before being opened to vehicle or pedestrian traffic. (Consult the manufacture's published application procedures for complete information.)

IV. MEASUREMENT AND PAYMENT

Aggregate reinforced thermoplastic pavement marking will be measured in square feet and paid for at the contract unit price per square feet, complete-in-place. This price shall be full compensation for furnishing and installing approved materials including but not limited to aggregate reinforce preformed thermoplastic panels, stamping templates, heating equipment, sealer, aggregate, vibratory plate compactor, and all other labor, tools, equipment, materials, and incidentals necessary to fully complete the work.

Pay Item	Pay Unit
Aggregate Reinforced Thermoplastic Pavement Marking	Square Feet

VIRGINIA DEPARTMENT OF TRANSPORTATION
SPECIAL PROVISION FOR
UTILITY TEST HOLES

April 1, 2014

I. DESCRIPTION

This item shall consist of performing test pits within the project for the purpose of locating underground utilities prior to excavation. Prior to any test pit operation, the Contractor is to review the location, number of test pits and the existing utilities with the City representative. The contractor shall obtain the vertical and horizontal location, measured off of the construction center line or base line, and determine the size of the utility line being test pitted. Test pits performed without prior authorization from the City representative will be at the Contractor's expense.

II. MATERIALS

Materials for backfill and pavement replacement shall meet applicable provisions of these specifications.

III. MEASUREMENT AND PAYMENT

Utility test holes will be measured and paid for at the contract unity price for each hole. This price shall include but not limited to all tools, materials, survey equipment and incidentals necessary to complete the work.

Pay Item

Utility Test Holes

Pay Unit

Each

VIRGINIA DEPARTMENT OF TRANSPORTATION
SPECIAL PROVISION FOR
WATER QUALITY STRUCTURE

April 1, 2014

I. DESCRIPTION

This work shall consist of furnishing and placing of a structural underground hydrodynamic separator (Water Quality Structure). The Contractor shall furnish all equipment, tools, labor, and materials necessary to complete the work in accordance with the plans and specifications.

II. MATERIALS

Materials for the **water quality structure** shall conform to the requirements set forth in this special provision.

Materials and methods of construction shall comply with the standards set forth by the American Society for Testing Materials (ASTM), and the American Association of State Highway and Transportation Officials (AASHTO), as well as all applicable requirements for local governing bodies. Installation shall be performed only by skilled laborers with a satisfactory record of performance on completed projects of comparable size and quality.

The separator shall be circular and constructed from pre-cast concrete circular riser and slab components. The internal fiberglass insert shall be bolted and sealed watertight inside the reinforced concrete component. The separator shall be capable to be used as a bend or junction structure within the stormwater drainage system.

All precast concrete components shall be designed and manufactured to a minimum live load of AASHTO HS-20 truck loading or greater based on local regulatory specifications.

The concrete joints shall be water-tight and meet the design criteria according to ASTM C-443. Mastic sealants or butyl tape are not an acceptable alternative.

The frame and cover shall include an indented top design with lettering of the unit's name cast into the cover to allow for easy identification in the field.

All reinforced concrete components shall be manufactured according to local specifications and shall meet the requirements of ASTM C 478.

The fiberglass portion of the water quality structure shall be constructed in accordance with the following standard: ASTM D-4097: Contact Molded Glass Fiber Reinforced Chemical Resistant Tanks.

All precast concrete sections shall be inspected to ensure that dimension, appearance and quality of the product meet local specifications and ASTM C 478.

GENERAL

The water quality structure shall remove oil and sediment from stormwater. The water quality structures shall be sized to handle the water quality volume and water quality flow as provided on the plans.

TOTAL SUSPENDED SOLIDS

The water quality structure shall be capable of removing 80 percent of the average annual total suspended solids. (TSS) load without scouring previous captured pollutants. Design

methodologies shall provide calculations substantiating removal efficiencies and correlation to field monitoring results using both particle size and TSS removal efficiency.

The manufacturer shall provide performance data that the water quality structure does not scour previously captured pollutants based on the particle size distribution specified in section 4 below. Performance data should be laboratory tested with an initial sediment load of 50 percent of the unit's sediment capacity at an operating rate of 125% or greater. Particle size distribution (PSD) for the initial sediment load shall conform to table 1.

FREE OIL

The separator must be capable of removing 95 percent of the floatable free oil. The first 16 inches (405 mm) of hydrocarbon storage shall be lined with fiberglass to provide a double wall containment of the hydrocarbon materials.

PARTICLE SIZE

The separator must be capable of trapping fine sand, silt, clay and organic particles in addition to larger sand, gravel particles and small floatables. The water quality structure shall be sized to specific particle size distribution that is clearly identified in both diameter and specific gravity. The example below is a Fine Particle Size that is a common PSD used in design of water quality structures to ensure proper design for capturing smaller particles and the high load of associated pollutants.

Table 1

Amount	Diameter	Specific Gravity
20%	20 micron	1.3
20%	60 micron	1.8
20%	150 micron	2.2
20%	400 micron	2.65
20%	2000 micron	2.65

MANUFACTURER

The water quality structure shall be an approved hydrodynamic structure that relies on settling or separation of pollutants from the runoff. Acceptable products include:

- 1.) Submerged Stormceptor
Imbrium Systems Inc.
www.stormceptor.com
- 2.) CDS, Vortechs OR VortSentry HS
Contech Construction Products, Inc.
www.contech-cpi.com
- 3.) BaySeparator
BaySaver Technologies, Inc.
www.baysaver.com
- 4.) Approved Equal

III. PROCEDURES

Each water quality structure shall be constructed according to the sizes shown on the Drawings and as specified by the manufacturer or VDOT specifications, whichever is more stringent. Install at elevations and locations shown on the Drawings or as otherwise directed by the Engineer.

IV. MEASUREMENT AND PAYMENT

Water quality structures will be measured and paid for at the contract unit price for each unit. This price shall be full compensation for furnishing and installing approved materials including but not limited to hydrodynamic separators, concrete, joints, frame and covers, fiberglass, preparation of subgrade, disposal of surplus material, and all other labor, tools, equipment, materials, and incidentals necessary to fully complete the work.

Pay Item

Water Quality Structure

Pay Unit

Each

VIRGINIA DEPARTMENT OF TRANSPORTATION
STANDARD SPECIFICATION MODIFICATION FOR
CULVERT INLET PROTECTION

August 8, 2014

SECTION 303.06(e) of the Supplemental Specification SS30305-0911 is amended to replace the paragraph beginning with "Inlet Protection Type C" with the following:

Culvert Inlet Protection will be measured in units of each and will be paid for at the contract unit price per each location shown or specified. The price shall include the furnishing and installation of the items shown in STD & SPEC 3.08 of the Virginia Erosion and Sediment Control Handbook. The individual pay items for Culvert Inlet Protection will be paid for only one time during the duration of the project for each location specified.

VIRGINIA DEPARTMENT OF TRANSPORTATION
STANDARD SPECIFICATION MODIFICATION FOR
AGGR. BASE MATL. AND ASPHALT CONCRETE

August 8, 2014

SECTION 309.06-Measurement and Payment of the Specifications is amended to replace the first paragraph with the following:

Aggregate base course will be measured in square yards of 1 in. depth (SY-IN) and paid for at the contract unit price per SY-IN. The quantity will be determined by compacted measurements on the road unless otherwise specified.

SECTION 309.06-Measurement and Payment of the Specifications is amended to replace the first pay item and pay unit of the fourth paragraph with the following:

Aggregate base material (Type/no.)	Square yard – inch
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SECTION 315.08-Measurement and Payment of the Specification is amended to replace the first sentence of the first paragraph with the following:

Asphalt concrete base will be measured in square yards of 1 in depth (SY-IN) and paid for at the contract unit price per SY-IN.

SECTION 315.08-Measurement and Payment of the Specification is amended to replace the first sentence of the second paragraph with the following:

Asphalt concrete will be measured in square yards of 1 in depth (SY-IN) and paid for at the contract unit price per SY-IN.

SECTION 315.08-Measurement and Payment of the Specifications is amended to replace the first two pay items and pay units of the eleventh paragraph with the following:

Asphalt concrete base course (Type)	Square yard – inch
Asphalt concrete (Type) (Class)	Square yard – inch

VIRGINIA DEPARTMENT OF TRANSPORTATION
STANDARD SPECIFICATION MODIFICATION FOR
REMOVAL AND SALVAGE OF TRAFFIC SIGNAL EQUIPMENT

DIVISION V – INCIDENTAL CONSTRUCTION

VDOT specification section 510 is amended to include the following:

VDOT specification section 510 – Relocating or Modifying Existing Miscellaneous Items of the Specifications is amended to include the following:

510.02 Materials

All existing NEMA TS-1 signal controllers and all cabinet equipment noted on the Plans to be removed are to be salvaged and delivered to the City of Hampton upon completion of the installation and activation and activation of the proposed TS-2 signal controllers and new cabinet equipment.

All existing metal poles noted on the Plans to be removed shall be salvaged and delivered to the City of Hampton. Items to be salvaged shall include all equipment mounted to the signal pole including signal heads, communications hardware, and signage. The contractor shall remove and dispose of associated conductors and cabling, and shall be responsible for removal of the foundation to 24 inches below final grade. Backfill all voids as described for trenching and directional drilling in Section 700 of the VDOT specification. Provide restoration of sidewalk, landscaping, or brick pavers if applicable to match surrounding conditions.

All existing junction boxes noted on the Plans to be removed shall be disposed of by the Contractor. This shall include backfilling of all holes as described for trenching and direction drilling in Section 700 of the VDOT specifications. Provide restoration of sidewalk, landscaping, or brick pavers to match surrounding conditions.

All existing signage noted on the Plans to be removed shall be salvaged and delivered to the City of Hampton. Contractor shall salvage all sign mounting hardware and return it to the City of Hampton.

510.03 Procedures

The Contractor is not to modify any existing structures during removal unless directed by the Engineer. Any damage or disturbance of existing structures or equipment not to be removed shall be repaired at the expense of the Contractor.

Remove and dispose or remove and salvage all City-owned signal and communications related equipment and material that will not be re-used as indicated in section 510.02 above. Return all traffic signal equipment and communication material identified for salvage to the City of Hampton at a time mutually agreed to by the Contractor and the City. Contractor shall contact John Yorks (757-726-2831) with the City of Hampton Department of Public Works Traffic Engineering and Operations Division to coordinate delivery of salvaged material. Replace or repair all material lost or damaged during its removal and transit. Label all returned equipment and material to indicate the location from which it was removed. The Contractor shall notify the City at least two business days in advance of scheduled delivery.

The City will deduct the cost of City-owned equipment damaged by the Contractor from money due to the Contractor.

510.04 Measurement and Payment

Remove Existing Signal Equipment will be measured and paid for as lump sum. The lump sum price includes but is not limited to the removal and disposal or removal and salvage of the junction boxes, signal heads, poles, mast-arms, pole/mast-arm/ground mounted signs, cabling, mounting hardware, radios transceivers, antennas, foundations, and associated cabinet equipment. Separate payment for landscape repair will not be made under this item and is considered incidental. Payment for concrete repair will be made according to Section 504 of the VDOT specifications.

VIRGINIA DEPARTMENT OF TRANSPORTATION
ITEM TYPE SPECIFICATION FOR
TRAFFIC SIGNAL

DIVISION VII – TRAFFIC CONTROL DEVICES

VDOT specification section 700.02 is amended as follows:

700.02(i) – Poles, posts, and overhead and bridge-mounted sign structures, is amended to include the following:

Steel poles and mast arms shall be hot-dipped galvanized in accordance with ASTM A123 and then powder coated black. Powder coat finish shall consist of a Urethane or Triglycidyl Isocyanurate (TGIC) Polyester Powder. The exterior steel surface shall be blast cleaned utilizing cast steel abrasives prior to pre-baking and degassing at the maximum temperature of 450 degrees Fahrenheit for a minimum of one (1) hour. Then all exterior surfaces shall be cleaned and coated with a Urethane or Triglycidyl Isocyanurate (TGIC) Polyester Powder to an average dry film thickness (DFT) of 4.0 mils (0.004”) with no readings below 3 mils (0.003”) within four (4) hours following pre-baking. The powder coating shall be electrostatically applied and then cured in a gas fired convection oven at a temperature range of 350-400 degrees Fahrenheit. The thermosetting powder resin shall provide both intercoat as well as substrate fusion adhesion the meets 5A or 5B classifications as ASTM D3359.

VDOT specification section 700.04 is amended as follows:

700.04(h) ninth paragraph, is entirely replaced by the following:

Non-metallic conduit with non-metallic cable (fiber optic) within shall be equipped with a No. 12 locator wire. Locator wire shall be grounded in accordance with the NEC for non-current carrying conductors. Pull locator wire simultaneously in a continuous length with the fiber optic cable. Provide waterproof butt splices where locator wire is spliced. Splicing is allowed only in cabinets, manholes, and junction boxes. Label all locator wires entering the equipment cabinet.

700.04 (h) is amended to include the following:

For conduit that contains fiber optic cable:

When obstructions are encountered during installation and conduit cannot be economically located elsewhere, the obstruction shall be bypassed by deflecting the conduit at a rate of at least 10:1. Minimum 4' radius, maximum 90° bends may be used to avoid obstructions at locations where 10:1 deflection is not possible, provided the least degree bend needed to clear the obstruction is used. Flexible bends may be utilized when needed to facilitate proper location of the conduit, only at locations approved by the Engineer. Conduit runs between any 2 junction boxes shall not employ more than 4 bends, or exceed an angular sum of 270°.

Furnish mechanical sealing devices that provide a watertight barrier between conduit and cables in conduit. Furnish mechanical sealing devices sized in accordance with conduit and with appropriately sized holes to accommodate and seal cables. Provide removable and re-usable mechanical sealing devices.

Furnish non-detectable underground marker tape with the wording “WARNING – Fiber Optic Cable” in all trenches.

Seal conduits containing fiber optic communications cable with mechanical sealing devices.

VDOT specification section 700.05, fifth paragraph, is entirely replaced by the following:

Signal poles will be measured in units of each and will be paid for at the contract unit price per each. This price shall include pole shafts, luminaire and surveillance camera arms, all metal finishing, grounding lugs, hand holes and covers, caps, identification tags, anchor bases, bolt covers, bracket arms, and breakaway support systems.

VDOT specification section 700.05, eleventh paragraph, is entirely replaced by the following:

Conduit will be measured in linear feet and will be paid for at the contract unit price per linear foot. This price shall include conduit bodies, fittings, bonding systems, pull ropes, pull tapes, plastic spacers, No. 12 locator wire when required, pull or splice boxes with an area of 512 cubic inches or less, supports, and protective metal shields.

VDOT specification section 703.02 is amended as follows:

703.02(a) – Traffic Signal Controllers, first paragraph, is amended to include the following:

Traffic signal controllers shall be NEMA TS-2 Type 2 capable of directly interfacing, without auxiliary devices/converters, and be fully compatible with the City of Hampton's Naztec computerized traffic signal system.

Traffic signal controllers shall be equipped with an RJ-45 Ethernet port capable of communicating with the central system using TCP/IP over an Ethernet-based network. A Naztec Model 980 controller shall be provided, or approved equivalent, unless otherwise approved by the Engineer.

703.02(d) – Cabinets, is entirely replaced by the sections entitled 703.05 – TS-2 Controller Cabinet Assembly, 703.06 – TS-2 Controller Cabinet Auxiliary Equipment, 703.07 – TS-2 1992 Cabinet Power Supply, and 703.08 – Malfunction Management Unit.

703.02(g), 3. Inductive Loop Detectors, is amended to include the following:

Loop detector amplifiers shall be 3M Canoga Model 824, or an approved equivalent, capable of directly interfacing with traffic controllers without the use of auxiliary devices.

Loop detector amplifiers shall detect and hold all licensed motor vehicles (including 50cc motorcycles) when connected to the proper loop configurations with lead-ins up to one mile with the proper sensitivity setting, without detecting vehicles in adjacent lanes. The output shall be for normal traffic control, with either presence or pulse output.

All output indicators, sensitivity controls, mode, and frequency switches shall be front panel accessible. All switch positions shall be clearly marked on the front panel. Integrated circuits having more than 16 leads shall be socket-mounted to facilitate repair and maintenance of units.

703.02(g) 4. Pedestrian Detectors, is amended to include the following:

Pedestrian detectors shall be Cambell Company Model 4 EVR RND (4 bolt), or an approved equivalent, capable of directly interfacing with traffic controllers without the use of auxiliary devices. Unit shall be black in color.

VDOT specification section 703.03 is amended as follows:

703.03(b) Equipment Color is entirely replaced by the following:

Equipment Color: The color of metal equipment shall be obtained by applying two coats of paint. The color of plastic equipment shall be obtained by impregnating the color into the plastic. When painting of aluminum and galvanized metal equipment is required, the equipment surface shall be treated to ensure adherence of the paint. Signal heads, insides of visors, and pedestrian signals, shall be flat black in color. Mounting brackets and backplates (both sides) and signal leveling attachments shall be flat black. The color of signal heads and pedestrian signal heads shall conform to MUTCD standards.

703.03(g), fourth paragraph, is entirely replaced by the following:

Detector and detector lead-in cables shall be permanently labeled at all access points. The labels shall be on stainless steel, nonferrous metal, or nylon tags attached to the cable with nylon cable ties. The identification shall be stamped or engraved on metal tags and neatly, legibly lettered with permanent ink on nylon tags. Each cable shall have a unique identifier, to be furnished by the Engineer. Cables shall be labeled immediately upon installation.

703.03(g), 2. third paragraph, is entirely replaced by the following:

A Megger reading of at least 100M ohms shall be obtained for each loop detector (cable and shield) only when new detector lead-in cable is also installed. This test shall be made at 500 volts immediately before the sealant is installed and again after the sealant has set at least 24 hours. Cable shall be disconnected from the detector amplifier during testing. This testing requirement is waived for locations where new loop detectors are being connected to existing detector lead-in cables.

703.03(g), 2. is amended to include the following:

A sawed slot shall have loop detector cable installed and sealed in a single work shift.

VDOT specification section 703.04 is amended as follows:

703.04, second paragraph, is entirely replaced by the following:

Controllers will be measured in units of each and will be paid for at the contract unit price per each. This price shall include timing data, timing implementation, training, controller cabinets, back panels, power panels, detector panels, auxiliary panels, police panels, thermostatically controlled fan units in the cabinet with a vent, flashers, local flasher switches, radio frequency interference filters, signal switches, main switches, police hand controls, conflict monitors, flasher relay assemblies, power relays, signal control assemblies, lamp receptacles and ground fault convenience receptacles, circuit diagrams, flexible cables, grounding systems, transient protection devices, and fittings.

703.04, fifteenth paragraph, is entirely replaced by the following:

Loop detectors shall be measured in units of each and will be paid for at the Contract unit price per each. This price shall include furnishing, installing, and testing the loop detector in accordance with the Plans and the Specifications. The costs of stand-alone testing of the detector loop, the detector lead-in cable, and the detector amplifier shall be included in the unit price for loop detectors. The unit price for loop detectors shall also include saw cutting, cleaning, and drilling, furnishing and installing PVC conduit to the roadside junction box, disposing of surplus material, furnishing and installing 12/1 conductor and polybutylene tube jacket, markings/identifications/permanent labeling, and splice kits, electrical tape, backer rods, and loop sealant material. The unit price shall be full compensation for furnishing all labor, materials tools, equipment, and incidentals necessary to complete the work.

SECTION 703.05 - TS-2 CONTROLLER CABINET ASSEMBLY

(Last revised: 3 February 2004)

1.0 SCOPE

This specification sets forth the minimum requirements for a control cabinet assembly. The cabinet assembly shall meet, as a minimum, all applicable sections of the NEMA Standard Publication No. TS-2 1992. All cabinets shall meet the requirements of a NEMA 3R rating, and shall be U.L. listed as an entire unit. Where differences occur, this specification shall govern.

2.0 CABINET DESIGN AND CONSTRUCTION

2.1 GENERAL

2.1.1 The cabinet and door(s) shall be constructed from type 5052-H32 aluminum with a minimum thickness of 0.125 inches. The top, door, and each side of the cabinet shall each be a single sheet of aluminum. Welding pieces together to form any of these surfaces shall not be permitted. External welds shall be made by using the Heliarc welding method, whereas internal welds will be made by the wire welding method. All welds shall be neatly formed and free of cracks, blowholes, and other irregularities.

2.1.2 All inside and outside edges of the cabinet shall be free of burrs. All sharp edges shall be made smooth.

2.1.3 The cabinet shall be designed and manufactured with materials that will allow ridged mounting, whether intended for pole, base or pedestal mounting. The cabinet must not flex on its mounting.

2.1.4 A rain channel shall be incorporated on all four (4) sides of the main door opening to prevent liquids from entering the enclosure. Cabinet door openings shall be double flanged outward on all four (4) sides to produce the rain channel.

2.1.5 The top of the cabinet shall incorporate a 1" (inch) slope toward the rear to prevent rain accumulation.

2.1.6 The cabinet shall be supplied with a natural aluminum finish. Sufficient care shall be taken in handling to ensure that scratches are minimized. All surfaces shall be cleaned of all oil residue and shall be free from weld flash.

2.1.7 All interior seams shall be sealed with RTV sealant or equivalent material.

2.1.8 All cabinets shall be supplied with two removable shelves manufactured from 5052-H32 aluminum having a minimum thickness of 0.125 inches. Shelves shall have a minimum depth of 10.5 inches.

2.1.9 One set of vertical "C" channels shall be mounted on each interior wall of the cabinet for the purpose of mounting the cabinet components. The size six (6) cabinets shall have an additional set of channels mounted on the left and right side walls. The mounting channels shall provide infinite horizontal and vertical adjustments of mounted equipment and shelves. The channels shall accommodate spring-mounted nuts or studs. All mounting rails shall extend to within four (4) inches of the top and bottom of the cabinets. Rivets or pop-rivets of any kinds shall not be used in the cabinet or on the main panel. No bolts or screws shall protrude through the outside walls, top, bottom, or sides of the cabinet.

2.1.10 All cabinets shall be supplied with four (4) anchor bolts to properly secure the cabinet to its base.

2.1.10.1 Bolt patterns for the size five (5) cabinets shall be as shown in Figure 7.8.3.1 of the NEMA Standards, except there shall be two (2) additional mounting slots centered in the right and left side mounting flanges.

2.1.10.2 Bolt patterns for the size six (6) cabinets shall be as shown in Figure 7.8.3.2 of the NEMA Standards.

2.1.11 The cabinet shall have an open bottom that is surrounded by a heavy duty attachment flange (lip) made of double thickness material having a minimum thickness of 0.25 inches. Around the opening, the flange shall be three (3) inches wide, plus or minus one-half ($\frac{1}{2}$) inch. One inch slots shall be provided in all four corners for the anchor bolts or for securing the removable bottom panel of pole mounted cabinets.

2.1.12 All size five (5) cabinets shall be provided with stiffener plates made from 0.250 inch aluminum and tack welded to the top and bottom of the rear wall to allow pole mounting.

2.1.13 All size five (5) cabinets shall be fitted with a removable 0.250-inch thick bottom panel. The bottom panel of the cabinet shall be removable to allow the cabinet to be used as a base mount type if desired. A closed cell neoprene pad having a minimum thickness of 0.5 inches shall be installed between the cabinet and the bottom panel to prevent dust and moisture from entering the cabinet. The pad shall cover the entire cabinet opening to the outside edges of the cabinet.

2.1.14 Each cabinet shall be of sufficient size to accommodate all equipment without crowding. Each piece of equipment shall have its own space on a shelf. It shall not be necessary to move any other piece of equipment in order to service any component or unit. All auxiliary equipment shall be accessible for removal or installation without moving any other component in the cabinet. The minimum cabinet sizes are as follows:

Size 5 Cabinets - 50" H x 36" W x 17" D

Size 6 Cabinets - 55" H x 44" W x 26" D

2.1.15 For reference, size 5 cabinets shall be pole-mounted cabinets. All pole-mounting hardware shall be supplied and shall be made of rustproof material. Top and bottom mounting brackets shall be supplied and shall permit the use of two (2) bands on each bracket (for secure mounting). Mounting brackets shall allow the use of a minimum of 3/4 - inch wide bands.

2.1.16 All size 5 cabinets shall be supplied with an Extender Base that is at least 15 inches in height. The extender base shall be made of 5052-H32 aluminum having a minimum thickness of 0.125 inches. The top and bottom opening shall match the bottom of the cabinet and shall have the same mounting bolt pattern as the cabinet. Extender base, mounting bolts, and gasket shall be supplied as one unit and separate from the size 5 cabinets.

2.1.17 All cabinets shall be equipped with a three(3) position alarm and light switch bracket. This bracket shall be attached to the top right corner of the door opening.

2.1.18 All size six (6) cabinets shall have a rear door similar to the main door excluding the police panel.

2.2 DOORS and HARDWARE

2.2.1 A stiffener plate shall be welded across the inside of the main door to prevent flexing. The stiffener plate shall not cover or prevent access to any door component(s).

2.2.2 The lower section of the cabinet door shall be equipped with a louvered air entrance. The air inlet shall be large enough to allow sufficient airflow per the rated fan capacity. Louvers must satisfy the NEMA rod entry test for 3R ventilated enclosures. A removable, fiberglass air filter shall be supplied with

each cabinet. The filter shall be secured to the air entrance in such fashion as to maintain close contact, at all times, to the louvered air entrance. The filter retainer shall be a slide fit design with no bolts or springs utilized to secure the filter to the door opening.

2.2.3 The roof of the cabinet shall incorporate an exhaust plenum with a vent screen. Perforations in the vent screen shall not exceed 0.125 inches in diameter.

2.2.4 The main and rear doors shall be equipped with a three-point draw roller type latching mechanism. The push rods shall be turned edgewise at the outward supports and shall be 0.250 inch by 0.750 inch aluminum, minimum. The push rods shall maintain a uniform thickness along their entire length. A reduction in thickness at the center latch point shall not be accepted.

2.2.4.1 Rollers shall have a minimum diameter of 0.875 inches and will be made of nylon. The center catch shall be fabricated from 0.187 aluminum, minimum.

2.2.5 The handle on the both doors shall utilize a stainless steel shank of 5/8 inches minimum diameter. The handle shall include a hasp for the attachment of an optional padlock. The cabinet door handle shall rotate counter-clockwise to open. The handle shall not extend beyond the perimeter of the main door at any time. The lock assembly shall be positioned so that the handle shall not cause any interference with the key when opening the cabinet door. When the door is closed and latched, the door shall automatically lock. It shall not be necessary to use a key in order to lock the door.

2.2.6 The main cabinet doors and police panel door hinges shall be a one-piece, continuous piano hinge. The hinge shall be located on the right side of the door when viewed from the front. The hinge and pin shall run the entire length of the door. All cabinet and police panel door hinge pins shall be capped at the top and bottom by weld to render the pin tamper proof.

2.2.6.1 The hinges shall be made of 0.093-inch thick aluminum and shall have a 3-inch open width with a 0.250-inch diameter stainless steel hinge pin. Door hinge shall be bolted to the cabinet and door with a 1/4-20 stainless steel carriage bolts and ny-lock nuts.

2.2.7 The main and rear doors shall be equipped with a mechanism to automatically hold the door open at approximately 90, 125, and 150 degrees, in windy conditions. The mechanism shall be pinned to prevent separation from the track. The door holding track shall be reinforced and tack welded along its top and bottom. Manual placement of the mechanism shall not be required by the field technician.

2.2.8 The main and rear doors shall be equipped with a Corbin tumbler lock number 4R38526 or approved equivalent. The lock shall be of brass construction, and shall have a swing-away cover. Two Virginia No. 2 keys shall be supplied and attached to each cabinet door upon shipment

2.2.7 The Rear cabinet door shall only be installed on size six (6) cabinets.

2.3 POLICE SWITCH COMPARTMENT

2.3.1 A switch compartment shall be provided on the main door.

2.3.2 The opening for the switch compartment door shall be double flanged on all four sides and shall incorporate a rain channel on all four sides.

2.3.3 The police door-in-door shall be provided with a treasury type lock Corbin No. R357SGS series, or approved equivalent. The lock shall be of brass construction, and shall have a swing away cover. All cabinets shall have a police panel door that utilizes a slam shut type latching mechanism. Two 3 ½" police keys shall be supplied and attached to each cabinet door upon shipment.

2.3.4 The door hinge for the switch compartment shall be 0.063-inch stainless steel with a 0.120-inch diameter stainless steel hinge pin.

3.0 TYPE 1 AND TYPE 2 TERMINALS AND FACILITIES MAIN PANEL DESIGN

3.1 The main panel shall be constructed from 5052-H32 brushed aluminum of 0.090 inches minimum thickness and formed so as to minimize any flexing when plug-in components are installed.

3.2 All main panels shall be hinged at the bottom to allow easy access to all wiring on the rear of the panel. The cabinet back panel conductors shall be arranged to allow the top of the panel to be tilted out through the main cabinet door. Removal or disconnecting of any conductors or equipment mounted on the side walls of the cabinet shall not be necessary.

3.3 The main panels shall be fully wired in the following configurations:

Type 1 Configuration 3 - Twelve load switch sockets, (eight vehicle sockets, two pedestrian sockets, and two overlaps assigned as overlap A and B), six flash transfer relay sockets, one flasher socket, and two main panel BIU rack positions. This configuration shall be installed into all size five (5) cabinets.

Type 1 Configuration 4 - Sixteen load switch sockets, (eight vehicle sockets, four pedestrian sockets and four overlap sockets) eight flash transfer relay sockets, one flasher socket and two main panel BIU rack positions. This configuration shall be installed into all size six (6) cabinets.

3.4 Reference designators for all load switch and flash transfer relay sockets shall be silk-screen labeled on the front and rear of the main panel.

Up to eight load switch sockets may be positioned horizontally or stacked in two rows on the main panel. If more than eight load switch sockets are required, they may be mounted in two horizontal rows. All load switch sockets, flasher sockets, and flash transfer sockets shall be mounted on the main panel only.

3.5 A bracket extending at least half the length of the load switch shall support all load switches. This support must be rigidly mounted to the main panel and be removable for maintenance by using hand tools only.

3.6 In Type 1 Main Panels, rack style mounting shall be provided to accommodate the required BIU's per the configuration listed in section 3.3 above. A dual - row, 64 - pin female din 41612 Type B connector shall be provided for each BIU rack position. Card guides shall be provided for both edges of the BIU. Terminal and facilities BIU mounting shall be an integral part of the main panel. Detector rack BIU mounting shall be an integral part of the detector rack.

3.6.1 In Type 1 Main Panels all BIU rack connectors shall have pre-wired address pins corresponding to the requirements of the TS 2 Specification. The address pins shall control the BIU mode of operation. BIU's shall be capable of being interchanged with no additional programming.

3.7 All twelve position main panels shall have all field wires terminated on one row of horizontally mounted terminal blocks. All sixteen position main panels shall have all field wires terminated within one or two rows of horizontally mounted terminal blocks. If two rows are used, the upper row shall be wired for the pedestrian and overlap field terminations. The lower row shall be reserved for phase one through eight vehicle field terminations.

3.7.1 A loading resistor having a nominal value of 2,000 ohms - 11 watt, shall be installed between the ground buss and each green and yellow signal output field connection terminal for vehicle phases 1,3,5,7. and all overlaps.

3.7.1 B Transient protection devices. Surge protection of load switch signal outputs - a metal oxide varistor shall be installed between a ground buss and each signal output field connection terminal for all vehicle, overlap, and pedestrian movements. The varistor shall have a 150 volt r.m.s. input rating and an energy rating of eighty joules. The varistor shall be a GE type V150LA20A or equal.

3.8 All field output circuits shall be terminated on a non-fused terminal block with a minimum rating of 20 amps.

3.9 All Type 2 Main panels shall provide means of programming the controller phase outputs to load switch inputs with only the use of a screwdriver.

3.10 Permanent alphanumerical labels shall identify all field input / output (I/O) terminals. All labels shall use standard nomenclature per the NEMA TS 2 Specification.

3.10.1 Type 1 Main Panels shall have as a minimum, terminals provided for the input / output signals listed in table 5.3.1 - 2 for terminal facilities configurations 3 and 4 of NEMA TS 2 - 1992 Standard.

3.10.2 Type 2 Main Panels shall have as a minimum, sufficient screw terminals shall be provided for the termination of the input / output functions described in section 5.3.2 of the TS 2 - 1992 Standard.

3.11 All flash color selection shall be accomplished at the field terminals with the use of a screwdriver only. It shall also be possible to select, through terminal connections, which of the two flasher circuits is connected to each phase. All cabinets shall be wired so that flasher circuit output #1 shall be wired for phases 1,2,5, and 6, overlap A and overlap B. Flasher output circuit #2 shall be wired for phases 3,4,7, and 8, overlap C and overlap D. All cabinets shall be pre-wired to flash phases 2 and 6 yellow and all other phases and overlaps red.

3.12 Field terminal blocks shall be wired to use a minimum of three positions per vehicle, pedestrian and overlap phase. All bolts and screws used for electrical connections shall be stainless steel. All equipment grounds shall run directly and independently to the Earth ground bus bar. All neutral conductors shall be carried throughout the cabinet without a break, splice, or fuse unless otherwise noted. A separate insulated Neutral Bus Bar with a minimum of twenty positions or terminal sized to allow three #12 wires per terminal shall be mounted to the main panel. A separate insulated Earth Ground Bus Bar with a minimum of ten positions or terminals sized to allow three #12 wires per terminal shall be mounted to the main panel. The mounting of each bus bar shall be ridged with minimal flexing at all points on the bar.

3.12.1 Signal output terminals shall be screw type, Compression type termination shall not be acceptable.

3.13 The main panel shall contain a flasher capable of operating a 15-amp, 2-pole, NEMA solid state flasher. A bracket that extends at least half its length shall support the flasher.

3.14 As a minimum, a RC network shall be wired in parallel with each group of three flash-transfer relay coils. A RC network shall be installed on all other relay coils.

3.15 All logic-level, NEMA Controller Unit and Malfunction Management Unit input and output terminations on the main panel shall be permanently labeled. Cabinet prints shall identify the function of each terminal position. All screws and terminals shall be made of stainless steel.

3.16 Type 1 Main Panel terminal blocks for DC signal interfacing shall have a number 6-32 x 7/32-inch screw as a minimum. All screws and terminals shall be made of stainless steel. Functions to be terminated shall be as specified in the listing of input / output Terminals in the NEMA TS 2 - 1992 Standard document (Section 5).

3.17 Type 2 Main Panels shall have as a minimum, terminal blocks shall be provided at the top of the main panel to provide access to the Controller Unit's programmable and non-programmable inputs and outputs. Terminal blocks for DC signal interfacing shall have a # 6-32 x 7/32-inch screw minimum. All screws and terminals shall be made of stainless steel.

3.18 All main panel wiring shall conform to the following wire size and color:

Green or Walk load switch output	brown wire	16 AWG
Yellow load switch output	yellow wire	16 AWG
Red/Don't Walk load switch output	red wire	16 AWG
MMU (other than AC power)	optional color	22 AWG
Controller Unit Input / Output	blue wire	22 AWG
AC Line (power panel to main panel)	black wire	***
AC Line (main panel)	black wire	***
AC Neutral (power panel to main panel)	white wire	***
AC Neutral (main panel)	white wire	***
Earth ground (power panel)	green wire	***
Logic ground	gray wire	22 AWG

*** Gauge varies with power panel / main panel set.
Unless otherwise noted, wire size shall comply with NEMA Standard TS 2 - 1992 Table 5.2.5 - 1.

3.19 All wiring, 14 AWG and smaller, shall conform to MIL-W-16878/1, type B/N, 600V, 19-strand tinned copper. The wire shall have a minimum of 0.010 inches thick PVC insulation with clear nylon jacket and rated to 105 degrees Celsius. All 12 AWG and larger wire shall have UL listed THHN / THWN 90 degrees Celsius, 600 V, 0.020 inches thick PVC insulation and clear nylon jacketed.

3.20 All Controller Unit and Malfunction Management Unit cables shall be of sufficient length to allow the units to be placed on either shelf or the outside top of the cabinet in the operating mode. Connecting cables shall be sleeved in a braided nylon mesh. The use of exposed tie-wraps or interwoven cables are unacceptable.

3.21 All cabinet configurations shall be provided with enough RS-485 Port 1 communication cables to allow full capabilities of that cabinet. Each communication cable connector shall be a 15-pin metal shell D sub-miniature type. The cable shall be a shielded cable suitable for RS-485 communications.

3.22 All main panels shall be pre-wired for a Type-16 Malfunction Management Unit.

3.23 All wiring shall be neat in appearance. All cabinet wiring shall be continuous from its point of origin to its termination point. Butt type connections/splices are not acceptable. All cabinet back panel conductors shall be soldered, at its destination point as specified. Printed circuit boards, except for BIU rack and pedestrian isolation boards, shall not be used on main panels.

3.24 All connecting cables and wire runs shall be secured by mechanical clamps. Stick-on type clamps are not acceptable.

3.25 The grounding system in the cabinet shall be divided into three separate circuits (AC Neutral, Earth Ground and Logic Ground). These ground circuits shall be connected together at a single point as outlined in the NEMA TS 2 Standard.

3.26 All pedestrian push-button inputs from the field to the controller shall be opto-isolated and operate at 12 VAC.

3.27 All wire (size 16 AWG or smaller) at solder joints shall be hooked or looped around the eyelet or terminal prior to soldering to ensure circuit integrity. Lap joint soldering is not acceptable. All connections to other than solder connections shall be made with insulated spade connectors.

3.28 All exposed or protruding 120 VAC terminals or screws shall be covered or shielded to prevent shock hazard to personnel.

3.29 All conductors used in cabinet wiring shall be identified by the use of a pre-printed sleeve or wire marker clearly visible and before attachment to a lug, terminal or making a connection. All unused wires shall be terminated and labeled at a terminal strip. The tying back of unused wires is not acceptable. All wiring harnesses shall be encased in a continuous mesh sheath. The use of cable ties to arrange wiring harnesses is not acceptable. All conductors and wiring harnesses shall be routed and arranged to allow easy access to all equipment and terminals.

3.30 The main panel shall incorporate a relay to remove +24 VDC from the common side of the load switches when the intersection is placed into flash. The main panel shall incorporate a relay or interlock that will initiate stop time to the controller on ring 1 and ring 2 whenever the intersection goes into a "conflict flash" condition. The relays mentioned above shall be Potter & Brumfield, Model KRAP-N11AG-120V or approved equal.

4.0 POWER PANEL DESIGN AND CONSTRUCTION

4.1 The power panel shall consist of a separate, fully enclosed module, securely fastened to the lower right side wall of the cabinet. The power panel shall be wired to provide the necessary power to the cabinet, controller, Malfunction Management Unit, cabinet power supply and auxiliary equipment. It shall be manufactured from 0.090 inch, 5052-H32 aluminum with removable plastic front cover. Standoffs for the plastic cover shall be insulated. Means shall be provided to allow access to the main and auxiliary breakers without removing the front cover. All components of the power panel shall be accessible for ease of replacement without removing any other components or equipment. Adequate space between components shall be provided for the tightening of all terminals. One blank terminal position shall be between the AC+ and AC- terminals.

4.2 The power panel shall be identical for all cabinets except for breaker sizing. The power panel shall house the following components:

All circuit breakers shall be single pole Square-D or approved equivalent and supplied in a Q.O.U. mounting. The main breaker shall be labeled "MAIN." A 50 AMP circuit breaker shall be installed in both size 5 and 6 cabinets. This breaker shall supply power to the controller, MMU, signals, cabinet power supply, isolation transformer, and separate breakers used to split the power feed and auxiliary panels. Breakers shall be thermal magnetic type, UL listed for HACR service, with a minimum of 10,000 amp interrupting capacity. All breakers shall be installed in a vertical orientation.

One (1) single pole fifteen amp (15-amp) breaker labeled "Auxiliary" shall supply power to the fans, lights and GFCI outlet. The power feed for this breaker shall not be fed from the load side of the main breaker but will be fed from the main feed side.

One (1) single pole fifteen amp (15-amp) breaker shall supply power to a SOLA CVS SERIES CONSTANT VOLTAGE TRANSFORMER TYPE 23-23-125-8 which shall be called (isolation transformer) throughout these specifications. No substitution shall be allowed. The isolation transformer shall be mounted inside the cabinet on the right side of the cabinet wall above the power panel. This breaker shall be labeled "ELECTRONIC EQUIPMENT". The power feed for this breaker shall be from the "line out equipment" side of the power line surge protector (EDCO Surrrestor SHA-1210). No substitute shall be allowed. The "neutral equipment" side of the same SHA-1210 shall be wired to the neutral input of the isolation transformer. The load side of the isolation transformer both AC+ and AC- (neutral) shall power the Controller Unit, Malfuction Management Unit, Power Supply, and the Lau Panel and no other equipment.

A 60-amp, 125 VAC radio interference line filter.

A normally open, 60-amp, solid state contactor with L.E.D. indicator shall be supplied.

One (1) Insulated AC Neutral bus bar with a minimum of twelve (12) positions capable of accepting three #12 wires per position.

One (1) Earth ground bus bar (chassis ground) with a minimum of seven (7) positions large enough to accept three #12 wires per position.

Convenience outlet wired as a standard AC receptacle. No GFCI protection allowed at this outlet.

A six (6) position (minimum) terminal block shall be provided for the termination of the AC+ Feed to the cabinet, the AC-Neutral Feed to the cabinet and the Earth Ground or (Chassis Ground) to the cabinet. A single hole compression lug capable of accepting as a minimum #10 AWG to a maximum #4 AWG wire shall be provided for each termination. The compression lug shall be a screwdriver slot type rated for copper wire. Four (4) terminal lugs shall be provided for each cabinet. These lugs shall be protected with a transparent cover. Means shall be provided for installing or tighten the cabinet service feeds without removing the protective cover.

5.0 Measurement and Payment

TS-2 Controller Cabinets will be measured in units of each and will be paid for at the contract unit price per each cabinet furnished and installed. Cabinets shall furnished to include all auxiliary equipment as listed in sections 703.06 and 703.07 below and shall include all necessary mounting hardware and all labor required for installation of the cabinet.

Payment will be made under:

<u>Pay Item</u>	<u>Pay Unit</u>
TS-2 Controller Cabinet	Each

SECTION 703.06 - TS-2 CONTROLLER CABINET AUXILIARY EQUIPMENT

(Last revised: 15 March 2011)

1.0 AUXILIARY CABINET EQUIPMENT

1.1 The cabinet shall be provided with two thermostatically controlled (adjustable between 80 - 150 degrees Fahrenheit) ventilation fans in the top of the cabinet plenum. Each fan shall be a ball bearing type fan and shall be capable of drawing a minimum of 100 cubic feet of air per minute. The fans shall have a minimum design life of one hundred thousand (100,000) hours. Each fan shall have its own thermostat, fan and thermostat shall be rated for one hundred and twenty-five percent (125%) of capacity. Each fan and thermostat assemble shall be fused. All fuse holders shall be of the encased type.

1.2 A fluorescent lighting fixture shall be mounted on the inside top of the cabinet near the front edge. The fixture shall be rated to accommodate a F15T8 lamp operated from a normal power factor UL or ETL listed ballast. The fluorescent lighting fixture shall be rapid start type and cold weather rated. The lamp shall be wired to a door-activated switch mounted near the top of the door. If the main door is closed the lamp will be off. The lamp shall be protected by a removable plastic tube, to prevent shattering if hit.

1.3 A rigid slide-out document tray shall be mounted below the bottom shelf. The tray shall be of sufficient size and strength to hold a complete set of cabinet wiring drawings, intersection diagrams, equipment and programming manuals for all equipment and modules applicable to each cabinet. The tray shall operate by sliding out, then opening a hinged cover to remove documents. After removing the documents and closing the cover, the tray shall serve as a suitable resting place for documents or a laptop computer. See diagram concerning the design and construction of this tray. As a reference, use Hennesy Products, Inc. Part No. 541.

1.4 Two (2) sets of complete and accurate cabinet wiring drawings shall be supplied with each cabinet.

1.5 One (1) set of manuals for the Controller Unit, Malfunction Management Unit, Power Supply, Detector Rack, Vehicle Detector Amplifier modules shall be supplied with each cabinet.

1.6 Two complete sets of schematics, logic drawings, and assembly drawings for each type of electronic unit supplied (i.e., Controller Unit, MMU, Power Supply, Load Switches, and Flashers). This documentation shall be provided prior to the delivery of any equipment and shall be a one-time shipment.

1.7 Two complete copies of component, hardware, and manufacturer indices of every item, unit, assemble and component within a cabinet, shall be included as part of these specifications. A complete listing of replacement parts and costs shall be included.

2.0 VEHICLE DETECTION

2.1 A vehicle detector amplifier rack(s) shall be provided in each cabinet. Detector racks for both sizes of cabinets shall have the following configuration:

2.1.1 Shall support 8 channels of loop detection, and one BIU contained within one (1) Detector Rack.

2.1.2 Both detector configurations shall accommodate an Opticom #754 Phase selector.

2.2 Each cabinet shall contain detector interface panels for the purpose of connecting field loops and vehicle detector amplifiers. These detector panels shall be hard wired. No printed circuit type will be allowed.

2.3 One 8-position interface panel shall be provided for each 8-channel detector rack per cabinet. The interface panel(s) shall be attached to the lower left side wall of the cabinet.

2.4 Each interface panel shall allow for the connection of a minimum of sixteen independent field loops. A ground bus terminal shall be provided between each loop pair terminal to provide a termination for the loop lead-in ground wire. Detector Terminals shall be screw type, Compression type termination shall not be acceptable.

2.5 All Interface panels shall be provided with lightning protective devices for all channels. All interface panels shall be provided with EDCO SRA-6 or approved equal lightning protective devices for all available inputs.

2.6 A cable consisting of 20 AWG twisted pair wires shall be provided to enable connection to and from the panel to a detector rack.

2.7 All termination points shall be identified by a unique number and silk-screened on the panel.

2.8 Each detector rack shall contain four (4) channel vehicle detectors. All detectors shall be interchangeable from detector rack to detector rack and from slot to slot without modification.

2.9 Each detector rack shall be powered by the cabinet power supply.

3.0 CABINET AUXILIARY SWITCH PANEL AND POLICE PANEL

3.1 An auxiliary switch panel shall be mounted on the inside of the main door. The auxiliary switch panel shall provide as a minimum the following:

- AUTO/FLASH SWITCH. When in the FLASH position, power shall be maintained to the controller and the intersection shall be placed in flash. The controller shall not be stop timed when in flash. When the switch is moved from FLASH position to the AUTO position, an external start signal shall be applied to the controller. This external start signal will force the controller to initiate the start up sequence when exiting flash.
- STOP TIME ON/OFF SWITCH. STOP TIME ON position, when applied, the controller shall be stop timed in the current interval.
- CONTROL EQUIPMENT POWER ON/OFF SWITCH. This switch shall control the Controller Unit, Malfunction Management Unit and Power Supply AC power. When in the ON position, the AC power shall be applied.
- Two (2) spare switch positions holds shall be provided and plugged for future use.

3.2 The police door switch panel shall contain the following:

- AUTO/FLASH SWITCH. When in the FLASH position, power shall be maintained to the controller and stop time shall be applied. The intersection shall be placed in flash. When the switch is moved from FLASH position to the AUTO position, an external start signal shall be applied to the controller. This will force the controller to initiate the start up sequence when exiting flash.
- AUTO/MANUAL SWITCH. Cabinet wiring shall include an AUTO/MANUAL toggle switch and a six (6') foot hand cord. The switch shall be in the top position in the AUTO mode. Hand cord shall be hardwired and not removable with the application of a plug in jack. Hand cord must be able to be stored with in the police panel compartment with police panel door completely secured and locked.

- **SIGNALS ON / SIGNALS OFF SWITCH.** This switch will remove all voltages to the signal heads and not put stop time to the controller.

3.3 All toggle type switches shall be heavy duty and rated 15 amps, at a minimum. Single or double-pole switches may be provided, as required.

3.4 Any exposed terminals or switch solder points shall be covered with a non-flexible shield to prevent accidental contact.

3.5 All switch functions shall be permanently and clearly labeled.

3.6 All wire routed to the police panel and auxiliary panel shall be adequately protected against damage from repetitive opening and closing of the main door. No modular connectors will be allowed in the cabinet except for the detector panel interface. All other cabinet wiring shall be "hard wired" point to point.

4.0 AUXILIARY DEVICES

4.1 LOAD SWITCHES

4.1.1 Load switches shall be solid state and shall conform to the requirements of Section 6.2 of the NEMA TS 2 Standard or as specified.

4.1.2 Signal load switches shall have a minimum load current rating of 10 amperes at 120 VAC for incandescent lamp load.

4.1.3 The front of the load switch shall embody a minimum of six LED indicators. Three indicators to show the input to the load switch and three indicators to show the output of the load switch.

4.1.4 Load switches shall be dedicated per phase. The use of load switches for other partial phases is not acceptable.

4.1.5 The full complement of load switches shall be supplied with each cabinet to allow for maximum phase utilization for which the cabinet is designed.

4.2 FLASHERS

4.2.1 The flasher shall be solid state design and shall conform to the requirements of section 6.3 of the NEMA TS 2 Standard.

4.2.2 Flashing of field circuits for the purpose of intersection flash shall be accomplished by separate flasher.

4.2.3 The flasher shall be rated at 15 amperes, double pole with a nominal flash rate of 60 FPM.

4.3 FLASH TRANSFER RELAYS

4.3.1 All flash transfer relays shall meet the requirements of Section 6.4 of the NEMA TS 2 Standard or as specified. Contacts shall be capable of making, breaking, with a contact current rating of twenty (20) amperes.

4.3.2 The coil of the flash transfer relay must be de-energized for flash operation.

4.3.3 The full complement of flash transfer relays shall be supplied with each cabinet to allow for maximum phase utilization for which the cabinet is designed.

4.4 MALFUNCTION MANAGEMENT UNITS

4.4.1 Each cabinet assembly shall be supplied with one Malfunction Management Unit (MMU) as defined by the requirements of Section 4 of the NEMA TS 2-1992 Standard.

4.4.2 Malfunction Management Units shall be a Type 16.

4.5 BUS INTERFACE UNITS

4.5.1 All Bus Interface Units (BIU's) shall meet the requirements of Section 8 of the NEMA TS 2-1992 Standard.

4.5.2 The full complement of Bus Interface Units shall be supplied with each cabinet to allow for maximum phase and function utilization for which the cabinet is designed.

4.5.3 Each Bus Interface Unit shall include power on, transmit, and valid data indicators. All indicators shall be LED's.

4.6 CABINET POWER SUPPLY

4.6.1 The cabinet power supply shall meet the requirements of Section 5.3.5 of the NEMA TS 2 Standard.

4.6.2 The cabinet power supply shall provide LED indicators for the line frequency, 12 VDC, 12 VAC, and 24 VDC outputs.

4.6.3 The cabinet power supply shall provide (on the front panel) jack plugs for access to the + 24 VDC for test purposes.

4.6.4 One (1) power supply shall be supplied with each cabinet assembly.

4.7 VEHICLE DETECTION SYSTEM

4.7.1 All detector racks shall contain a full complement of four (4) channel detectors detector amplifier that are compatible with conventional loops.

4.8 SPLICE TRAYS

4.8.1 Each cabinet shall house a fiber optic splice tray.

4.9 Controller adapter harness

4.9.1 Cabinets shall include an adapter harness in order to energize a TS2 type 2 controller.

4.10 Ethernet switch

4.10.1 Cabinets shall include a field hardened Ethernet switch. Switch shall be a Cisco IE-3000-8TC or approved equal and shall include two (2) GBIC modules rated for 20 km or greater. Two (2) additional GBIC modules shall be provided for integration into the Traffic Management Center.

5.0 MEASUREMENT AND PAYMENT

No separate measurement and payment will be made for TS-2 Controller Cabinet Auxiliary Equipment. TS-2 Controller Cabinet Auxiliary Equipment shall be paid for under Section 703.05.

SECTION 703.07 - TS-2 1992 CABINET POWER SUPPLY

(Last revised: 23 February 2003)

1.0 INTRODUCTION

The TS 2 cabinet power supply shall provide regulated DC power, unregulated AC power and a line frequency reference for the TS 2-detector rack, Bus Interface Units, load switches, and other auxiliary equipment. As a minimum, the power supply shall meet all applicable requirements of the NEMA TS2-1992 Standard. Where differences occur, this specification shall govern.

2.0 ENCLOSURE

2.1 The power supply shall be compact so as to fit in limited cabinet space. It shall be capable of being mounted on a shelf. In addition, the power supply shall be capable of being wall mounted using key-hole slots on the rear of the power enclosure.

2.2 The power supply shall be constructed of sheet aluminum and shall be finished with an attractive and durable protective coating.

3.0 PRINTED CIRCUIT ASSEMBLIES

3.1 MATERIALS

All printed circuit boards shall be made from NEMA FR.-4 glass epoxy or equivalent (see NEMA LI-1989 Industrial Laminated Thermosetting Products).

3.2 DESIGN

All printed circuit boards shall meet the following requirements to enhance reliability:

- All plated-through holes and exposed circuit traces shall be plated with solder.
- Both sides of the printed circuit board shall be covered with a solder mask material.
- The circuit reference designation for all components and the polarity of all capacitors and diodes shall be clearly marked adjacent to the component. Pin 1 for all integrated circuit packages shall be designated on both sides of all printed circuit boards.
- All electrical mating surfaces shall be gold plated.
- All printed circuit board assemblies shall be coated on both sides with a clear moisture-proof and fungus-proof sealant.

4.0 ENVIRONMENTAL REQUIREMENTS

The power supply shall perform its specified functions when the ambient temperature and humidity are within the specified limits defined in Section 2 of NEMA TS2-1992 Standard.

5.0 ELECTRICAL REQUIREMENTS

As a minimum, the electrical requirements shall follow those described in Section 5 of the NEMA TS2-1992 Standard, plus all other applicable sections.

6.0 INPUT / OUTPUT CONNECTIONS

6.1 PIN CONNECTIONS

The power supply connector shall be located on the front of the unit, have a metallic shell which is connected to the chassis ground internally and mate with an MS3106 ()-18 -1SW cable connector, or equivalent.

Connector pin terminations shall be as follows:

PIN	FUNCTION
A	AC Neutral
B	Line Frequency Reference
C	AC Line
D	+ 12 VDC
E	+ 24 VDC
F	Reserved
G	Logic Ground
H	Earth Ground
I	12 VAC
J	Reserved

7.0 INDICATORS AND TEST POINTS

7.1 INDICATORS

The power supply shall include LED indicators to display the status of all outputs.

7.2 TEST POINTS

The power supply shall include banana jack style test points for the following signals:

- + 24 VDC
- Logic Ground

8.0 TEST

The functions of each power supply shall be thoroughly tested to insure compliance with the requirements of this specification. Upon completion of initial tests, each power supply shall be burned in at a minimum

of 74 degrees C for 48 hours. After burn-in, the functions of the power supply shall be re-tested to insure satisfactory operation.

9.0 MEASUREMENT AND PAYMENT

No separate measurement and payment will be made for TS-2 1992 Cabinet Power Supply. TS-2 1992 Cabinet Power Supply shall be paid for under Section 703.05.

SECTION 703.08 - MALFUNCTION MANAGEMENT UNIT

1.0 INTRODUCTION

This specification sets forth the minimum requirements for a shelf-mountable, sixteen channel, solid-state Malfunction Management Unit (MMU). The MMU shall meet, as a minimum, all applicable sections of the NEMA Standards Publication No. TS 2-1992. An independent testing laboratory shall verify that the MMU will perform all its defined functions under the conditions set forth in Section 2 of the NEMA STANDARD (Environmental Standards and Test Procedures). Where differences occur, this specification shall govern. The MMU shall be compatible with Naztec Model 980 traffic signal controllers and the City's existing Naztec central system software, MMU Model 516L-E LCD, or an approved equivalent.

2.0 HARDWARE

2.1 ENCLOSURE

2.1.1 The MMU shall be compact so as to fit in limited cabinet space. It shall be installed on a shelf that is at least 10" deep. Overall dimensions, including mating connectors and harness, shall not exceed 10.5" x 4.5 x 11" (H x W x D).

2.1.2 The enclosure shall be constructed of sheet aluminum with a minimum thickness of 0.062", and shall be finished with an attractive and durable protective coating. Model, serial number, and program information shall be permanently displayed on the rear surface.

2.2 ELECTRONICS

2.2.1 A microprocessor shall be used for all timing and control functions. Continuing operation of the microprocessor shall be verified by an independent monitor circuit, which shall force the OUTPUT RELAY to the de-energized "fault" state and indicate an error message if a pulse is not received from the microprocessor within a defined period.

2.2.2 In the interest of serviceability all I.C.'s shall be installed in sockets.

2.2.3 A built-in high-efficiency power supply shall generate all required internal voltages. All voltages shall be regulated and shall be monitored with control signals. Failure of the internal power supply to provide proper operating voltages shall force the OUTPUT RELAY to the de-energized "fault" state and indicate an error message. A front panel mounted fuse shall be provided for the 120 VAC input.

2.2.4 User-programmed configuration settings shall be stored in an electrically erasable programmable read-only memory (EEPROM) or via front panel DIP switches. Designs using a battery to maintain configuration data shall not be acceptable.

2.2.5 All 120 VAC field terminal inputs shall provide an input impedance of at least 150K ohms and be terminated with a resistor having a power dissipation rating of 0.5 Watts or greater. A separate precision voltage-comparing device shall sense each 120 VAC field terminal input.

2.2.6 All electrical components used in the MMU shall be rated by the component manufacturer to operate over the full NEMA temperature range of -30 degrees C to +74 degrees C.

2.2.7 All printed circuit boards shall meet the requirements of the NEMA Standard plus the following requirements to enhance reliability:

- All plated-through holes and exposed circuit traces shall be plated with solder.
- Both sides of the printed circuit board shall be covered with a solder mask material.

- The circuit reference designation for all components and the polarity of all capacitors and diodes shall be clearly marked adjacent to the component. Pin #1 for all integrated circuit packages shall be designated on both sides of all printed circuit boards.
- All electrical mating surfaces shall be gold plated.
- All printed circuit board assemblies shall be coated on both sides with a clear moisture-proof and fungus-proof sealant.

2.3 FRONT PANEL and CONNECTORS

2.3.1 All displays, configuration switches, and connectors shall be mounted on the front panel of the MMU. All MMU configuration inputs beyond those required by the NEMA Standard shall be provided by front panel mounted DIP switches and shall be clearly labeled. Configuration DIP switches shall be provided for the following functions:

- Field Check / Dual Enables 1 - 16
- Green / Yellow - Dual Indication Enable
- BND Test Disable
- External Watchdog Enable

2.3.2 The connectors on the MMU shall have a metallic shell and be attached to the chassis internally. They shall be manufactured to meet MIL-C 26482 specifications. The connectors shall be mounted on the front of the unit in accordance with the following: Connector A shall mate with a MS 3116 22-55 SZ, and Connector B shall mate with a MS 3116 16-26 S.

2.3.2.1 In the interest of reliability and reparability, printed circuit board mounted MS connectors shall not be acceptable. Internal MS harness wire shall be a minimum of AWG #22, 19 strand.

2.3.3 All indicator lights shall be water clear, T-1 package, Red Super Bright type LED's. Indicators shall be provided for the following items:

- Channel Status 1 - 16
- Conflict
- Red Fail
- CVM / External Watchdog
- 24V -2
- 24V -1
- Clearance Fail
- Port 1 Fail
- Diagnostic / Program Card
- Dual Indication
- Type 12 mode
- Power
- Port 1 Receive
- Port 2 Transmit

2.4 OPERATING MODES

2.4.1 The MMU shall operate in both the Type 12 mode and the Type 16 mode as required by the NEMA Standard.

3.0 MONITORING FUNCTIONS

The following monitoring functions shall be provided in addition to those required by the NEMA Standard Section 4.

3.1 DUAL INDICATION MONITORING

3.1.1 Sixteen switches labeled FIELD CHECK / DUAL ENABLES shall be provided on the MMU front panel to enable Dual Indication Monitoring on a per channel basis. The Dual Indication Monitor function shall provide two modes of operation, Dual Indication Fault and Green/Yellow - Dual Indication Fault.

3.1.2 When voltages on two inputs of a channel are sensed as active for more than 1000 msec, the MMU shall enter the fault mode, transfer the OUTPUT relay contacts to the FAULT position, and illuminate the DUAL INDICATION indicator. The MMU shall remain in the fault mode until the RESET button or the EXTERNAL RESET input resets the unit. When voltages on two inputs of a channel are sensed as active for less than 700 msec, the MMU shall not transfer the OUTPUT relay contacts to the FAULT position.

3.1.3 When operating in the Type 16 mode with Port 1 communications enabled, Bit #68 (Spare Bit #2) of the Type #129 response frame shall be set to indicate a Dual Indication fault has been detected.

3.1.4 Dual Indication Monitoring shall be disabled when the RED ENABLE is not active. When operating in the Type 16 mode with Port 1 communications enabled, Dual Indication Monitoring shall also be disabled if the LOAD SWITCH FLASH bit is set to " 1 " in the Type #0 message from the Controller Unit.

3.2 DUAL INDICATION MONITOR

3.2.1 Dual Indication monitoring shall detect simultaneous input combinations of active Green (Walk), Yellow or Red (Don't Walk) field signal inputs on the same channel. In Type 12 mode, this monitoring function detects simultaneous input combinations of active Green and Yellow, Green and Red, Yellow and Red, Walk and Yellow, or Walk and Red field inputs on the same channel.

3.3 FIELD CHECK MONITORING

3.3.1 Sixteen switches labeled FIELD CHECK / DUAL ENABLES shall be provided on the MMU front panel to enable Field Check Monitoring on a per channel basis. The Field Check Monitor function shall provide two modes of operation, Field Check Fault and Field Check Status.

3.3.2 Field Check Monitoring shall be disabled when the RED ENABLE input is not active. When operating in the Type 16 mode with Port 1 Communications enable, Field Check Monitoring shall also be disabled if the LOAD SWITCH FLASH bit is set to " 1 " in the Type #0 message from the Controller Unit. The Field Check Monitoring function shall be disabled in the Type 12 mode.

3.4 EXTERNAL WATCHDOG MONITOR

3.4.1 The MMU shall provide the capability to monitor an optional external logic level output from a Controller Unit or other external cabinet circuitry. If the MMU does not receive a change in state on the EXTERNAL WATCHDOG input for 1500 msec (\pm 100 msec), the MMU shall enter the fault mode, transfer the OUTPUT relay contacts to the FAULT position, and illuminate the CVM / WATCHDOG indicator. The MMU shall remain in the fault mode until the RESET button or the EXTERNAL RESET input resets the unit. An MMU Power Failure shall reset the CVM / WATCHDOG fault state of the monitor.

3.4.2 When operating in the Type 6 mode with Port 1 communications, enabled, Bit #70 (Spare Bit #4) of the Type #129 response frame shall be set to indicate an External Watchdog fault has been detected.

3.5 TYPE FAULT MONITOR

3.5.1 The MMU shall verify at power-up that the Type 12 or Type 16 operating mode as determined by the TYPE SELECT input that is consistent with the mode set by the last external reset.

3.5.2 Detection of a Type Fault shall place the MMU into the fault mode, transfer the OUTPUT relay contacts to the FAULT position, illuminate the DIAGNOSTIC indicator, and flash the Type 12 indicator at a 2 Hz rate. The MMU shall remain in the fault mode until the RESET button or the EXTERNAL RESET input resets the unit. An MMU Power Failure shall reset the Type Fault State of the monitor.

4.0 DISPLAY FUNCTIONS

The following display functions shall be provided in addition to those required by the NEMA Standard Section 4.

4.1 YELLOW PLUS RED CLEARANCE INTERVAL DISPLAY

4.1.1 The MMU Channel Status display shall indicate with a steadily illuminated LED indicator, those channels which had the short Yellow plus Red interval (i.e., those channels which did not meet the minimum Yellow Change plus Red Clearance Interval). The conflicting channel(s) which was sensed active Green causing the Minimum Yellow Change plus Red Clearance Fault shall also be indicated with a single pulsed LED indicator.

4.2 FIELD CHECK STATUS DISPLAY

4.2.1 The FIELD CHECK FAIL indicator shall illuminate when a Field Check Fault is detected. The Channel Status display shall show the channels on which the Field Check Fault occurred.

4.2.2. If Field Check errors occurred during a Conflict Fault, Red Fail, Clearance Fail, or Dual Indication Fail, the FIELD CHECK FAIL indicator shall illuminate and double pulse every 2 seconds. The channels on which the Field Check Status was detected during the fault shall double pulse on the Channel Status Display at the same time as the FIELD CHECK FAIL indicator.

4.3 DISPLAY INDICATORS

The following display indicators shall be provided in addition to those required by the NEMA Standard Section 4.

4.3.1 The TYPE 12 indicator shall illuminate when the MMU is programmed for Type 12 operation. If a Type Fault is detected the DIAGNOSTIC / PGM CARD indicator shall illuminate and the TYPE 12 indicator shall flash at a rate of 2 Hz.

4.3.2 The BND FAIL indicator shall illuminate when a BND Fault is detected. The Channel Status display shall show the channels that were detected as BND Fail.

4.3.3 The DUAL INDICATION indicator shall illuminate when a DUAL INDICATION Fault is detected. The Channel Status display shall show the channels that were detected as DUAL INDICATION.

4.3.4 The POWER indicator shall flash at a rate of 2 Hz when the AC LINE voltage is below the dropout level. It shall illuminate steadily when the AC LINE voltage returns above the restore level.

4.3.5 The RECEIVE indicator shall illuminate for a 33 msec pulse each time a Prot 1 message is correctly received from the Controller Unit.

4.3.6 The TRANSMIT indicator shall illuminate whenever the MMU has the Port 1 transmitter enabled.

4.3.7 The DIAGNOSTIC / PGM CARD indicator shall flash at a 2 Hz rate if the Programming Card is absent or not seated properly in its mating connector.

5.0 ADDITIONAL FEATURES

5.1 The MMU shall include both automatic and operator initiated diagnostics.

5.1.1 Automatic diagnostics shall verify memory and microprocessor operation each time power is reapplied to the MMU. After power has been applied, diagnostics shall continually verify the operation of essential elements of the MMU including at a minimum: PROM, EEPROM, communications, internal power supply, and the microprocessor.

5.1.2 Operator initiated diagnostics shall allow the operator to verify proper operation of all indicator lights, PROM, EEPROM, RAM, and microprocessor.

5.1 Measurement and Payment

No separate measurement and payment shall be made for Malfunction Management Units. Payment shall be made in accordance with section 703.04 of the VDOT specifications.

VIRGINIA DEPARTMENT OF TRANSPORTATION
SPECIAL PROVISION FOR
CITY PROVIDED SIGNS

SECTION 801 INSTALL CITY PROVIDED SIGNS

DESCRIPTION:

The contractor shall provide all mounting hardware and labor necessary to install City-provided traffic signs on existing and proposed structures as shown on the plans and specified in the specifications.

MATERIALS:

All mounting hardware shall comply with the VDOT specifications for sign mounting hardware.

Metal sign post shall be VDOT standard STP-1 2" metal post.

PROCEDURES:

Contractor shall coordinate with the City for delivery of City-provided signs. Contractor shall submit request to City for required signs at least one week prior to obtaining signs from the City.

MEASUREMENT AND PAYMENT:

Install City Provided Sign will be measured as each sign installed and shall be paid for at the contract unit price for each. The cost shall include all necessary hardware to mount signs to existing and proposed structures as indicated on the plans.

Payment will be made under:

<u>Pay Item</u>	<u>Pay Unit</u>
Install City Provided Sign	Each

VIRGINIA DEPARTMENT OF TRANSPORTATION
SPECIAL PROVISION FOR
EMERGENCY VEHICLE PREEMPTION

SECTION 804 - EMERGENCY VEHICLE PREEMPTION

1. DESCRIPTION

This work shall consist of furnishing and installing emergency preemption equipment in accordance with these specifications and as shown on the plans or as directed by the Engineer.

2. EQUIPMENT

Emergency preemption equipment shall be optically activated providing all features and functions as the existing equipment with the City's emergency preemption system and shall fully interface with that existing equipment. Existing equipment consists of 3M's Model 754 Phase Selectors and Model 711 Optical Detectors.

Conductor cables between the optical detectors and the phase selectors/system chassis shall be in accordance with Section 703.02(d) 3b of the Specifications.

Mounting assemblies for the detectors and emitters shall be fabricated from corrosion resistant materials or shall be galvanized.

3. PROCEDURES

Locations of optical detectors shown on plans are approximate; exact locations shall be as required for proper alignment. Installation of all emergency preemption equipment shall be in accordance with the manufacturer's recommendations. The Contractor shall provide all equipment necessary to completely install this equipment including programming the phase selectors. Software required for programming the phase selectors shall remain the property of the Contractor. Emergency preemption conductor cables shall be permanently identified in accordance with Section 703.03(g) of the Specifications except tags shall indicate preempt detector (preempt confirmation for the 14/2 cable) and the direction of approach. The Contractor shall provide the manufacturer's installation, operational and maintenance manuals for each piece of equipment to the Engineer.

4. TESTING

Testing of the emergency preemption system shall be accomplished in the presence of the City. The Contractor shall contact the City 48 hours in advance to arrange system testing. The City will provide an operator and vehicle equipped with an emitter for the test to determine if equipment is operating and logging properly. Deficiencies shall be corrected and faulty equipment replaced by the Contractor at no expense to the City.

5. MEASUREMENT AND PAYMENT

Emergency vehicle preemption device (4 way) will be measured in units of each and will be paid for at the contract unit price per each. This price shall include the mounting bracket necessary to install the detector on a mast arm as shown on the plan, mounting and wiring the detector, cabling to connect the optical detectors to the cabinet equipment, installation of the encoded detector card(s), software, relay detector panel, cabinet wiring harness(es), transient protection, installing and wiring all items into the controller cabinet to ensure proper operations of emergency vehicle preemption on each approach of the intersection. No separate measurement or payment will be made for testing, adjustments for proper system operation, or system documentation.

Payment will be made under:

<u>Pay Item</u>	<u>Pay Unit</u>
Emergency vehicle preemption device (4 way)	Each

VIRGINIA DEPARTMENT OF TRANSPORTATION
SPECIAL PROVISION FOR
VIDEO DETECTION

SECTION 805 VIDEO DETECTION

1. DESCRIPTION

This work shall consist of furnishing and installing a four-way video vehicle detection system in accordance with these specifications and as shown on the plans or as directed by the Engineer.

2. EQUIPMENT

Contractor shall furnish and install City standard Traficon video detection equipment. Contractor shall provide all necessary cameras, mounting hardware, and cabinet equipment necessary to incorporate the video detection system into the existing signal equipment cabinet. Detection shall be provided on all four approaches of the intersection.

Video detection cable for connecting detection cameras to the cabinet equipment shall conform with specifications necessary to work with City standard Traficon video detection equipment.

3. PROCEDURES

Locations of video detectors shown on plans are approximate; exact locations shall be as required for proper detection. Installation of all video detection equipment shall be in accordance with the manufacturer's recommendations. The Contractor shall provide all equipment necessary to completely install this equipment. The Contractor shall provide the manufacturer's installation, operational and maintenance manuals for each piece of equipment to the Engineer.

4. TESTING

Testing of the video detection system shall be accomplished in the presence of the City. The Contractor shall contact the City 48 hours in advance to arrange system testing. Deficiencies shall be corrected and faulty equipment replaced by the Contractor at no expense to the City.

5. MEASUREMENT AND PAYMENT

Video detection system will be measured and paid for as each four-way video detection system furnished and installed. This price shall include all necessary cameras, camera mounting hardware to install the cameras on mast arms as shown on the plans, mounting and wiring the camera, all necessary cabinet equipment, testing and all adjustments necessary for proper system operation.

Video detection cable will be measured in unit of linear feet and will be paid for at the contract unit price per linear foot. This price shall include furnishing and installing the video detection cable between the cameras and equipment in the controller cabinet, all wiring terminations, markings and identifications, and connections for proper system operation.

Payment will be made under:

<u>Pay Item</u>	<u>Pay Unit</u>
Video detection system	Each
Video detection cable	Linear Foot

VIRGINIA DEPARTMENT OF TRANSPORTATION
SPECIAL PROVISION FOR
FIBER OPTIC COMMUNICATIONS

SECTION 806 – FIBER OPTIC COMMUNICATIONS

1. Description

Furnish and install single mode fiber-optic (SMFO) communications cable, fiber optic termination unit, and all necessary hardware.

2. Materials

A. SMFO Cable

Furnish loose tube, gel free fiber-optic cable with required fiber count that complies with RDUP/RUS CFR 1755.900, single mode with a dielectric central member. Use single mode fiber in cable that does not exceed 0.3 dB/km at 1550 nm and 0.4 dB/km at 1310 nm. Provide cable with all fibers that are useable and with a surface sufficiently free of imperfections and inclusions to meet optical, mechanical, and environmental requirements. Provide cable with minimum of one ripcord under sheath for easy sheath removal and with shipping, storage and operating temperature of at least -40 to 158 degrees F, installation temperature of -20 to 158 degrees F with a dual layered, UV cured acrylate fiber coating applied by cable manufacturer that may be stripped mechanically or chemically without damaging fiber. Provide cable with strength rods to control fiber bending and prevent twisting of the cable.

Provide fibers inside a loose buffer tube cable. Use a super absorbent, water swellable yarn or tape for each cable. Distinguish each fiber and buffer from others by means of color coding that meets EIA/TIA-598-B Color Coding of Fiber-Optic Cables.

Provide cable with high tensile strength aramid yarns or fiberglass yarns that are helically stranded evenly around the cable core.

Provide cable jacket of consistent thickness that is free of holes, splits, and blisters, and containing no metal elements. Provide outer jacket of medium density polyethylene with minimum nominal sheath thickness of 0.050 inch. Ensure polyethylene contains carbon black for ultraviolet light protection and does not promote the growth of fungus.

Cable shall have a minimum bend radius of 20 times cable diameter or less (for installation) and 10 times cable diameter or less (for long term).

Provide length markings in sequential feet and within one percent of actual cable length. Ensure that character height of the markings is approximately 0.10 inch.

B. FIBER TERMINATION UNIT

For termination of the cable in the equipment cabinet, cable is to be terminated on a single-panel housing (SPH) unit with capacity for 12 individual fibers. The SPH unit shall be outdoor rated and shall occupy a volume of no more than 1.0 cubic feet. The unit shall be equipped with mounting brackets to secure the unit to the interior of the cabinet.

The termination unit shall have a pull-out shelf that allows easy access to the splice tray, buffer tube, and fiber storage area that permits fusion splicing to be conducted at a minimum distance of 10 feet from the housing.

Termination units shall be properly sized for the required number of splices and terminations. The fiber optic splice enclosure shall meet the following requirements:

- Have provisions for minimum of six (6) fiber optic cable entries
- Have provisions for internally securing the fiber optic cable sheath and central strength member for a minimum of six (6) fiber optic cables
- Rack mounted
- Have front and rear doors or removable panels
- Have a top, bottom, and 4 sides that fully enclose the interior and protect its contents from physical damage
- Provisions for neatly routing cables, buffer tubes, and fan-out tubing
- Have cable management brackets or rings integral to the unit to secure and route cables from the connector modules and splice trays to the vertical rack members while maintaining a minimum 38 mm cable radius

C. Aerial Splice Enclosure

Furnish splice enclosures that are re-enterable using a mechanical dome-to-base seal with a flash test valve, and are impervious to the entry of foreign material (water, dust, etc.). Ensure enclosures are manufactured in such a manner to be suitable for aerial installation.

Provide enclosures with a minimum of four round ports (for single cables) that will accommodate all cables entering enclosure. Provide heat shrink cable shields with enclosure to ensure weather tight seal where each cable enters enclosure.

Within enclosures, provide enough hinged mountable splice trays to store the number of splices required, plus the capacity to house six additional splices. Ensure enclosures allow sufficient space to prevent microbending of the buffer tubes when coiled.

Provide splice trays that hold, protect, and organize optical fibers, and that secure fibers inside the splice tray.

Provide splice trays that are dielectric.

D. Communications Cable Identification Markers

Furnish orange communications cable identification markers that are resistant to fading when exposed to UV sources and changes in weather. Use markers designed to coil around fiber-optic cable, and that do not slide or move along the surface of the cable once installed. Ensure exposure to UV light and weather does not affect the markers natural coiling effect or deteriorate performance. For all fiber optic cables furnish cable wraps containing the following text in black:

WARNING
CITY OF HAMPTON TRAFFIC FIBER OPTIC CABLE
CONTACT TELEPHONE NUMBER:
(757) 726-2831
WARNING
CITY OF HAMPTON TRAFFIC FIBER OPTIC CABLE

Overall Marker Dimensions: 7" (l) x 4" (w)
Lettering Height: 3/8 inch for *WARNING*, 1/4" for all other lettering

3. Construction Methods

A. General

Install single mode fiber-optic (SMFO) fiber communications cables, communications cable identification markers, and all necessary hardware.

Comply with manufacturer's recommendations. Install communications cable in conduits as required to bring the fiber-optic cable into and, if necessary, out of each splice enclosure.

Take all precautions necessary to ensure that communication cables are not damaged during storage, handling, and installation. Do not violate the minimum bending radius as recommended by the manufacturer. Do not step on cable nor run over cable with vehicles or equipment. Do not pull cable over or around obstructions, or along the ground.

Determine lengths of cable necessary to reach from termination point to termination point. Install cable in continuous lengths between approved splicing facilities. Additionally, provide a sufficient amount of slack cable to allow for an additional 20 feet of cable to be present after removal of outer sheath for termination. Measure slack cable by extending cable straight out of cabinet door and/or manholes.

Keep cable ends sealed at all times during installation to effectively prevent the ingress of moisture. Use approved heat shrink cable end cap. Do not use tape to seal cable ends.

Before installing cables, provide three copies of the cable manufacturers' recommended and maximum pulling tension for each cable type/size. Do not exceed the manufacturer's recommended pulling tension. Use pulling grips containing a rotating swivel. Coil cable in a figure-8 configuration whenever cable is unreeled for subsequent pulling.

All fiber optic splices shall be individual fusion splices.

B. Underground Installation

Install SMFO communication cabling underground in conduit using cable pulling lubricants recommended by the cable manufacturer. Obtain approval of cable pulling lubricant and method of pulling before installing underground fiber-optic and twisted-pair cables.

The Contractor shall use existing pull rope in existing conduit to install fiber-optic cable whenever possible. For portions of existing conduit without existing pull rope, the contractor may, at the discretion of the Engineer, use existing cable as a pull rope to install new fiber optic cable.

The Contractor shall be responsible for determining the viability of portions of existing conduit.

Use a dynamometer (clutch device) so as not to exceed the maximum allowable pulling tension if the cable is pulled by mechanical means. Do not use a motorized vehicle to generate cable pulling forces.

Keep tension on the cable reel and pulling line at the start of each pull. Do not release tension if the pulling operation is halted. Restart the pulling operation by gradually increasing tension until the cable is in motion.

For pulling cable through junction boxes feed cable by manually rotating the reel. Do not pull cable through intermediate junction boxes, handholds, or openings in conduit unless otherwise approved.

Install communications cable identification markers on each communications cable entering a junction box.

C. AERIAL Installation

Lash SMFO cable to existing aerial communications cable span.

Provide either 0.05" x 0.30" aluminum wrapping tape or 0.06" stainless steel lashing wire for lashing cables to messenger cable or existing communication cable. When requested by the City, furnish samples of wire to the City at no additional cost.

Install all wire with necessary hardware including, but not limited to shoulder eyebolts, washers, nuts, thimbleeyelets, three-bolt clamps, J-hooks, split bolt connectors, and lashing material.

D. Installation of FIBER TERMINATION UNIT

At equipment cabinet end of the drop cable, terminate all fibers on the SPH unit. After terminating all fibers, fasten the unit to an interior surface of the cabinet, if possible. Otherwise, rest the unit on a shelf.

Install termination unit with connector panels, splice trays, and all necessary hardware.

Fusion splice and secure SMFO cable in splice trays inside the splice enclosure. Ensure all buffer tubes are contained within splice trays so no bare fibers are outside tray. For all buffer tubes designated to pass through splice enclosure, neatly coil the excess tubing inside basket provided with enclosure.

Do not exceed 0.05 dB of attenuation per splice.

Furnish strain relief so that no tensile force is on the SMFO cable when it is held within the interconnect center or aerial splice enclosure.

Do not damage fiber or violate the minimum bending radius of the fiber.

Label all fiber-optic splices. Obtain approval of fiber-optic connector labeling method.

Install heat shrink cable shields using methods recommended by the manufacturer of the enclosure.

Install enclosures with enough slack cable to allow enclosure to be lowered to ground level and extended into a splicing vehicle that is located within 10 feet of the equipment cabinet.

Contractor shall coordinate with the City to determine proper connection of fiber optic cable to existing Ethernet switch. Connection to existing Ethernet switch shall be considered incidental to the installation of the termination unit.

E. TESTING FIBER CABLING

Provide cable manufacturer's attenuation and Optical Time Domain Reflectometer (OTDR) testing data for each reel of cable prior to installation, in a format approved and accepted by the Engineer.

Provide written notification a minimum of ten days before beginning OTDR tests. The Engineer must be present during all testing. Test whole segments following installation. Test all existing fibers prior to reuse.

After splicing is completed, perform bi-directional OTDR test on each fiber, including unused fibers. Install 1,000 meter pre-tested launch cable between the OTDR and the fiber optic to be tested.

Ensure fusion splice losses do not exceed 0.05 dB and connectors have a loss of 0.5 dB or less. If any fiber exceeds maximum allowable attenuation or if fiber properties of the cable have been impaired, take appropriate actions up to and including replacement of the fiber cable. Corrective action will be at no additional cost to the City.

Clearly label each OTDR trace identifying a starting and ending point for all fibers being tested. Record the attenuation level of each fiber and clearly indicate OTDR trace results in report format. Furnish one hard copy of each of the OTDR trace results and electronic copies of all trace results on a compact disk or other electronic media approved by the Engineer. Furnish the manufacturer's make, model number, and software version of the OTDR used for testing.

4. Measurement and Payment

SMFO Cable (24 Fiber) - will be measured and paid as the actual linear feet of fiber-optic cable furnished, installed, tested, and accepted. Measurement will be made by calculating the difference in length markings located on outer jacket from start of run to end of run for each run. Coordination with the City of Hampton, as required, shall be incidental to the price. Terminate all fibers before determining length of cable run. No separate measurement or payment shall be made for shoulder eyebolts, washers, nuts, thimbleyelets, three-bolt clamps, J-hooks, split bolt connectors, lashing material, or any tools or hardware necessary to complete installation of the fiber optic cable.

Fiber Optic Termination Unit will be measured and paid as each termination unit furnished, installed, tested, and accepted. Separate payment will not be made for mounting hardware, fiber optic splicing, pigtails, connectors, or any equipment necessary to complete installation and splicing of fiber optic cable or termination unit. Connection of fiber optic cable to existing Ethernet switch shall be considered incidental to the installation of the Fiber Optic Termination Unit. All pairs shall be terminated before determining the length of cable run.

Aerial Splice Enclosure will be measured and paid as the actual number of fiber-optic splice enclosures furnished, installed, and accepted in accord with the following conditions: No measurement will be made of splice trays, pigtails, jumpers, connector panels, and testing, as these will be considered incidental to furnishing and installing aerial splice enclosures.

Payment will be made under:

<u>Pay Item</u>	<u>Pay Unit</u>
SMFO Cable (24 Fiber)	Linear Foot
Fiber Optic Termination Unit	Each
Aerial Splice Enclosure	Each

— APPENDIX —



REPORT OF SUBSURFACE INVESTIGATION AND GEOTECHNICAL ENGINEERING SERVICES

**North King St. & Little Back River Rd.
Traffic Signal Poles**

Hampton, Virginia

G E T Project No: WM14-104G

March 24, 2014

PREPARED FOR:



Kimley-Horn and Associates, Inc.

March 24, 2014

TO: **Kimley-Horn and Associates, Inc.**
4500 Main Street, Suite 500
Virginia Beach, Virginia 23462

Attn: Mr. Kyle D. Williams, P.E.

RE: Report of Subsurface Investigation and Geotechnical Engineering Services
North King Street and Little Back River Road
Traffic Signal Poles
Hampton, Virginia
G E T Project No: WM14-104G

Dear Mr. Williams:

In compliance with your instructions, we have completed our Subsurface Investigation and Geotechnical Engineering Services for the referenced project. The results of this study, together with our recommendations, are presented in this report.

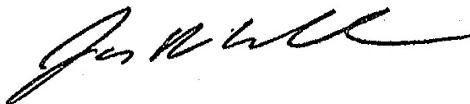
Often, because of design and construction details that occur on a project, questions arise concerning subsurface conditions. **G E T Solutions, Inc.** would be pleased to continue its role as Geotechnical Engineer during the project implementation.

Thank you for the opportunity to work with you on this project. We trust that the information contained herein meets your immediate need, and should you have any questions or if we could be of further assistance, please do not hesitate to contact us.

Respectfully Submitted,
G E T Solutions, Inc.



Joseph R. Robinson, P.E.
Project Engineer
VA Lic. # 050157



James R. Wheeler
Senior Project Geologist



Copies: (1) Client

TABLE OF CONTENTS

1.0	PROJECT INFORMATION	1
1.1	Project Authorization.....	1
1.2	Project Description.....	1
1.3	Purpose and Scope of Services	1
2.0	FIELD AND LABORATORY PROCEDURES	2
2.1	Field Investigation.....	2
2.2	Laboratory Testing.....	3
3.0	SITE AND SUBSURFACE CONDITIONS.....	3
3.1	Site Location and Description	3
3.2	Site Geology	3
3.3	Subsurface Soil Conditions.....	4
3.4	Groundwater Information	4
4.0	EVALUATION AND RECOMMENDATIONS.....	5
4.1	Foundation Discussion	5
4.2	Excavations	6
5.0	REPORT LIMITATIONS.....	7
APPENDIX I - BORING LOCATION PLAN		
APPENDIX II - BORING LOGS		
APPENDIX III - GENERALIZED SUBSURFACE PROFILE		
APPENDIX IV - PHOTOGRAPHS OF EXCAVATED TEST PITS		
APPENDIX V - GROUND PENETRATING RADAR REPORT		

1.0 PROJECT INFORMATION

1.1 Project Authorization

G E T Solutions, Inc. has completed our subsurface investigation and geotechnical engineering services for the proposed North King Street and Little Back River Road - Traffic Signal Poles project located in Hampton, Virginia. The geotechnical engineering services were conducted in general accordance with **G E T** Proposal No. PWM14-101G R-2. Authorization to proceed with our services was received in the form of an Individual Project Order (GET227-14-001HOC).

1.2 Project Description

The development at this site is expected to consist of installing three (3) new traffic signal poles at the intersection of North King Street and Little Back River Road in Hampton, Virginia. Specifically, one traffic signal pole will be installed within the northeast quadrant of the intersection, one traffic signal pole will be installed within the southeast quadrant of the intersection and one traffic signal pole will be installed within the southwest quadrant of the intersection.

If any of the noted information is incorrect or has changed, please inform **G E T Solutions, Inc.** so that we may amend the recommendations presented in this report, if appropriate.

1.3 Purpose and Scope of Services

The purpose of this study was to obtain information on the general subsurface conditions at the proposed project site as related to the signal poles' foundations and earthwork design/construction and other geotechnical aspects, in addition to identifying the locations of shallow underground utilities (upper 4 feet) within the proposed foundation areas. The subsurface conditions encountered were then evaluated with respect to the available project characteristics. In this regard, engineering assessments for the following items were formulated:

1. General assessment of the soils revealed by the borings performed at the proposed signal pole locations.
2. General location and description of potentially deleterious material encountered in the borings that may interfere with construction progress, including existing fills or surficial/subsurface organic deposits.
3. Manual excavation at the pole foundation locations for clearing of existing shallow underground utilities.
4. Soil design parameters required for the foundation systems.

The scope of services did not include an environmental assessment for determining the presence or absence of wetlands or hazardous or toxic material in the soil, bedrock, surface water, groundwater or air, on or below or around this site. Prior to development of this site, an environmental assessment is advisable.

2.0 FIELD AND LABORATORY PROCEDURES

2.1 Field Investigation

In order to explore the general subsurface soil types and to aid in developing associated foundation design parameters, two (2) 35-foot deep Standard Penetration Test (SPT) borings (designated as B-1 and B-2) were drilled within the vicinity of the proposed signal poles located within the northeast and southwest quadrants of the intersection (one each).

The SPT borings were performed with the use of wash “mud” drilling procedures in general accordance with ASTM D 1586. The tests were performed continuously from the existing ground surface to a depth of 12-feet, and at 5-foot intervals thereafter. The soil samples were obtained with a standard 1.4” I.D., 2” O.D., 30” long split-spoon sampler. The sampler was driven with blows of a 140 lb. hammer falling 30 inches, using an automatic hammer. The number of blows required to drive the sampler each 6-inch increment of penetration was recorded and is shown on the boring logs. The sum of the second and third penetration increments is termed the SPT N-value (uncorrected for automatic hammer). A representative portion of each disturbed split-spoon sample was collected with each SPT, placed in a glass jar, sealed, labeled, and returned to our laboratory for review.

In addition to the soil test borings, two (2) five-foot by five-foot square excavations (designated as TP-1 and TP-2) approximately four feet deep were excavated and off-set as required at the proposed signal pole locations (one each) to clear the shallow underground utilities. Upon completion of the excavations, a 4-foot long piece of reinforcing steel (no. 4 bar) was placed in the approximate center of each test pit and photographs (included in Appendix IV) were taken at the test pit location. Underground utilities were not encountered at the test pit locations. However, what appeared to be an abandoned concrete footing was encountered at the location of test pit TP-1. The abandoned footing was encountered at a depth of approximately 10-inches below existing grade along the eastern face of the excavation and, as such, the excavation was off-set approximately 9-inches to the west.

The excavations were backfilled with the excavated soils and three measurements were taken from the approximate center of each test pit to an existing feature (signs, traffic lights, etc.). These measurements are provided in the table (Table I) below.

Table I - Test Pit Locations

TEST PIT #	TEST PIT LOCATION (center)
TP-1	30' Northeast of the corner of the existing structure 23' 9" South of the existing sewer manhole 5' 4" West of the existing power pole
TP-2	20' Northwest of the existing sewer manhole 15' 9" Southwest of the corner of the existing storm grate 10' 10" East of the existing Gas Station sign pole
GPR Scan	36' East of “Stop Here on Red” sign in channelized island 62' Northeast of existing power pole 72' Southwest of existing sewer manhole

In lieu of performing a test pit excavation at the proposed signal pole location within the southeast quadrant of the intersection, a ground penetrating radar scan was performed. This was considered necessary as the signal pole location lies within the existing roadway. The ground penetrating radar scan was performed utilizing a GSSI SIR-3000 radar unit with a 4,000 MHz antenna. The signal pole location was clear of underground utilities to a depth of 4 feet. A more detailed report of the ground penetrating radar scan is included in Appendix V attached to this report.

The boring, test pit and ground penetrating radar scan locations were established by the client and located in the field by a representative of **G E T Solutions, Inc.** The approximate boring, test pit and GPR scan locations are shown on the attached "Boring Location Plan" (Appendix I), which was reproduced based on the site plan provided by the client.

2.2 Laboratory Testing

Representative portions of all soil samples collected during drilling were sealed in glass jars, labeled and transferred to our laboratory for classification and analysis. The soil classification was performed by a Geotechnical Engineer in accordance with ASTM D2488.

3.0 SITE AND SUBSURFACE CONDITIONS

3.1 Site Location and Description

The proposed project site is located at the intersection of North King Street and Little Back River Road in the City of Hampton, Virginia. At the time of our field reconnaissance, the project site consisted of paved roadways, sidewalks, overhead and underground utilities, and grass covered areas.

3.2 Site Geology

The project site lies within a major physiographic province called the Atlantic Coastal Plain. Numerous transgressions and regressions of the Atlantic Ocean have deposited marine, lagoonal, and fluvial (stream lain) sediments. The regional geology is very complex, and generally consists of interbedded layers of varying mixtures of sands, silts and clays. Based on our review of existing geologic and soil boring data, the geologic stratigraphy encountered in our subsurface Investigations generally consisted of marine deposited sands and clays.

3.3 Subsurface Soil Conditions

The results of our soil test borings are tabulated below:

AVERAGE DEPTH (Feet)	STRATUM	DESCRIPTION	RANGES OF SPT ⁽¹⁾ N-VALUES
0 to 0.17	Topsoil	2 inches of topsoil material (boring B-2 only)	-
0 to 0.42	Pavement	5 inches of asphalt (boring B-1 only) <i>*Aggregate base material not encountered at the boring location.</i>	-
0.17 - 0.42 to 2	Fill	SAND (SM) with varying amounts of Silt, Clay, Gravel and fibrous organics Lean CLAY (CL) with varying amounts of Silt, Sand and brick fragments	<u>Granular</u> 5 <u>Cohesive</u> 6
2 to 4 - 8	I	SAND (SC, SM) with varying amounts of Silt and Clay	5 - 11
4 to 6	II	Lean CLAY (CL) with varying amounts of Silt and Sand (boring B-1 only)	10
6 - 8 to 35	III	SAND (SM) with varying amounts of Silt, Clay and marine shell fragments <i>*The soils of this layer were comprised of the geologic formation termed the "Yorktown Formation"</i>	5 - 10

Notes: (1) SPT = Standard Penetration Test, N-Values in Blows-per-foot (uncorrected for automatic hammer)

The subsurface description is of a generalized nature provided to highlight the major soil strata encountered. The records of the subsurface Investigation are included on the "Boring Log" sheets (Appendix II) and in the "Generalized Soil Profile" (Appendix III), which should be reviewed for specific information as to the individual borings. The stratifications shown on the records of the subsurface Investigation represent the conditions only at the actual boring locations. Variations may occur and should be expected between boring locations. The stratifications represent the approximate boundary between subsurface materials and the transition may be gradual or occur between sample intervals. It is noted that the topsoil designation references the presence of surficial organic laden soil, and does not represent any particular quality specification. This material is to be tested for approval prior to use.

3.4 Groundwater Information

The groundwater level was recorded at the boring locations and as observed through the relative wetness of the recovered soil samples during the drilling operations. The initial groundwater table was determined to occur at depths ranging from 7 to 8 feet below current grades at the boring locations at the time of our site reconnaissance. The bore holes were backfilled upon completion for safety reasons, thus these readings may not be indicative of the static groundwater level.

As subsurface soils begin to dry moisture moves upwards through the soil profile by means of capillary action. Based on the subsurface soil composition, these initial groundwater readings (based on the relative wetness of the soils) could be in part attributed to the capillary action of the soils. As such, if the static groundwater elevation is critical to the design of the proposed structures and site infrastructure it is recommended to install temporary groundwater monitoring wells to substantiate these initial readings.

Groundwater conditions will vary with environmental variations and seasonal conditions, such as the frequency and magnitude of rainfall patterns, as well as man-made influences, such as existing swales, drainage ponds, underdrains and areas of covered soil (paved parking lots, side walks, etc.). In the project's area, seasonal groundwater fluctuations of ± 2 feet are common; however, greater fluctuations have been documented. Again, we recommend that the contractor determine the actual groundwater levels at the time of the construction to determine groundwater impact on the construction procedures, if necessary.

4.0 EVALUATION AND RECOMMENDATIONS

Our recommendations are based on the previously discussed project information, our interpretation of the soil test borings and our observations during our site reconnaissance. If the proposed construction should vary from what was described, we request the opportunity to review our recommendations and make any necessary changes.

4.1 Foundation Discussion

The proposed signal poles' foundations should be designed to resist the overturning moments, uplift, torsion and shear forces. Based on our experience with similar projects, it is expected that the signal poles will be supported by drilled shaft foundations.

We recommend that the estimated design parameters and capacities shown in the following table be used to design the signal poles' foundations consisting of drilled caissons. These parameters were developed based on the understanding that the bearing soils will be clean and free of loose soils and the perimeter walls of the excavation will be stable during the concrete placement. Additionally, the estimated soil parameters shown in this report (Table II) were developed based on the soil conditions and the N-values encountered at the boring locations. Soil conditions as well as soil parameters at other locations than those encountered at the boring locations may be different. When the drilling operations are complete, concrete should be placed inside the casing as soon as possible. It is recommended that concrete in a caisson be poured the same day that the caisson is drilled. We recommend caisson construction be completed in general accordance with the manual titled Drilled Shafts: Construction Procedures and Design Methods, Publications No. FHWA - NHI - 010 - 016.

A qualified representative of **G E T Solutions Inc.** should verify that caisson is bearing on competent materials and that the caisson installation procedures comply with the specifications.

Table II - Summary of Estimated Soil Parameters

Stratum	I	II	III
Approximate Depth (ft)	4 to 8	4 to 6	6 - 8 to 35
Soil Classification (USCS)	SC, SM	CL	SM
SPT Average N-value	8	10	7
Estimated Moist Unit Weight (pcf)	115	105	115
Estimated Saturated Unit Weight (pcf)	130	110	130
Estimated Buoyant Unit Weight (pcf)	68	48	68
Friction Angle (ϕ) (degrees)	30	5	30
Cohesion (c) (psf)	0	600	0
Active Soil Pressure K_a	0.33	0.83	0.33
Passive Soil Pressure K_p	3.0	1.2	3.0

The size and depth of the drilled piers should be determined by the Structural Engineer or the pole manufacturer.

4.2 Excavations

In Federal Register, Volume 54, No. 209 (October, 1989), the United States Department of Labor, Occupational Safety and Health Administration (OSHA) amended its "Construction Standards for Excavations, 29 CFR, part 1926, Subpart P". This document was issued to better insure the safety of workmen entering trenches or excavations. It is mandated by this federal regulation that all excavations, whether they be utility trenches, basement excavation or footing excavations, be constructed in accordance with the new (OSHA) guidelines. It is our understanding that these regulations are being strictly enforced and if they are not closely followed, the owner and the contractor could be liable for substantial penalties.

The contractor is solely responsible for designing and constructing stable, temporary excavations and should shore, slope, or bench the sides of the excavations as required to maintain stability of both the excavation sides and bottom. The contractor's responsible person, as defined in 29 CFR Part 1926, should evaluate the soil exposed in the excavations as part of the contractor's safety procedures. In no case should slope height, slope inclination, or excavation depth, including utility trench excavation depth, exceed those specified in local, state, and federal safety regulations.

We are providing this information solely as a service to our client. **G E T Solutions, Inc.** is not assuming responsibility for construction site safety or the contractor's activities; such responsibility is not being implied and should not be inferred.

5.0 REPORT LIMITATIONS

The recommendations submitted are based on the available soil information obtained by **G E T Solutions, Inc.** and the information supplied by the client and their consultants for the proposed project. If there are any revisions to the plans for this project or if deviations from the subsurface conditions noted in this report are encountered during construction, **G E T Solutions, Inc.** should be notified immediately to determine if changes in the foundation recommendations are required. If **G E T Solutions, Inc.** is not retained to perform these functions, **G E T Solutions, Inc.** can not be responsible for the impact of those conditions on the geotechnical recommendations for the project.

The Geotechnical Engineer warrants that the findings, recommendations, specifications or professional advice contained herein have been made in accordance with generally accepted professional geotechnical engineering practices in the local area. No other warranties are implied or expressed.

After the plans and specifications are more complete the Geotechnical Engineer should be provided the opportunity to review the final design plans and specifications to assure our engineering recommendations have been properly incorporated into the design documents, in order that the earthwork and foundation recommendations may be properly interpreted and implemented. At that time, it may be necessary to submit supplementary recommendations. This report has been prepared for the exclusive use of Kimley-Horn and Associates, Inc. and their consultants for the specific application to the proposed traffic signal poles located at the intersection of North King Street and Little Back River Road in Hampton, Virginia.

APPENDICES

I.
BORING LOCATION PLAN

II.
BORING LOGS

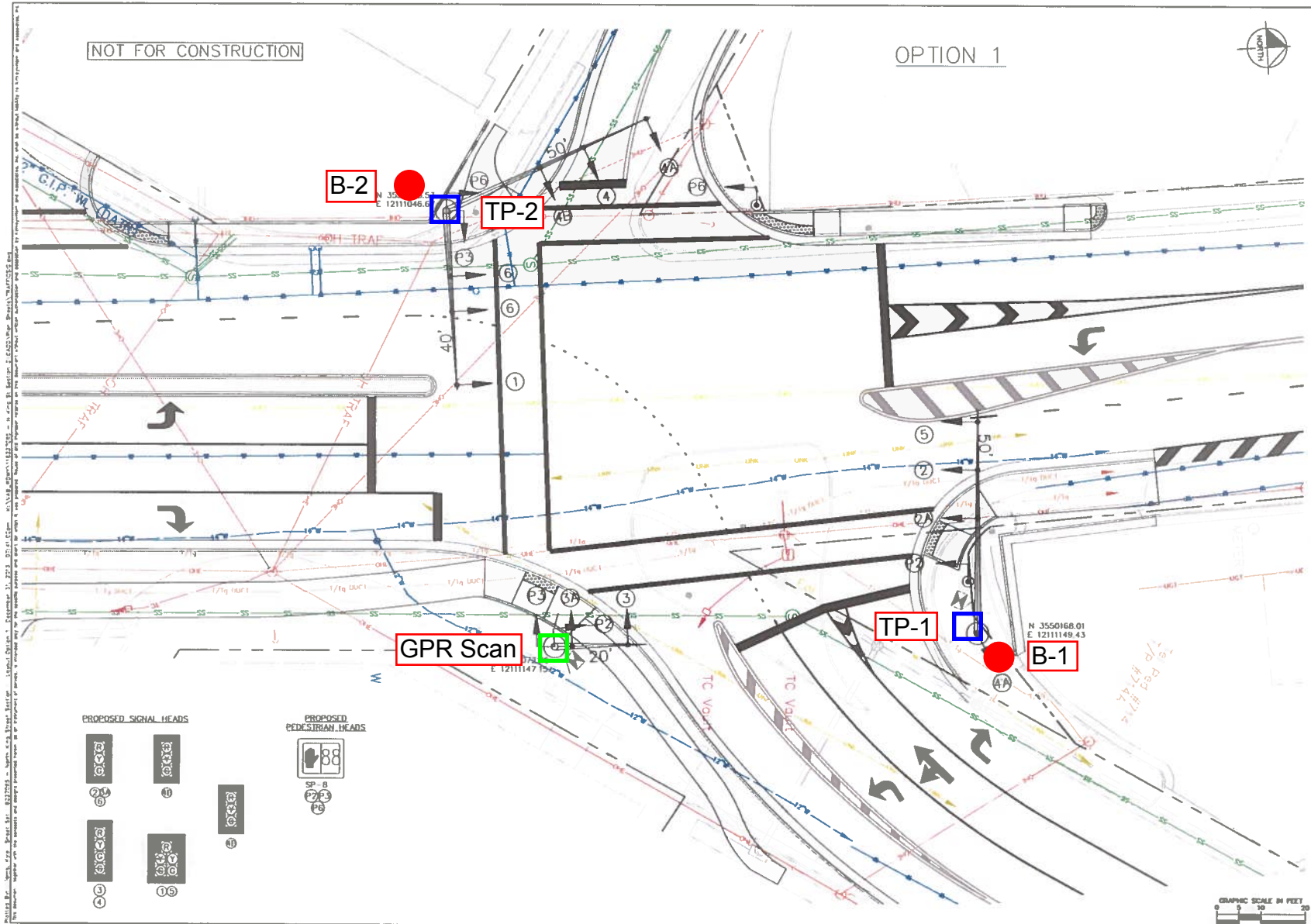
III.
GENERALIZED SUBSURFACE PROFILE

IV.
PHOTOGRAPHS OF EXCAVATED TEST PITS

V.
GROUND PENETRATING RADAR REPORT

APPENDIX I

BORING LOCATION PLAN



<p>PROJECT: NORTH KING STREET / LITTLE BACK RIVER ROAD INTERSECTION IMPROVEMENTS</p> <p>SHEET NUMBER: 4</p>	<p>30% SIGNAL DESIGN PLANS</p> <p>Option 1</p>	<p>DATE: 9/26/13</p> <p>SCALE: AS SHOWN</p> <p>DESIGNED BY: JCK</p> <p>CHECKED BY: JCK</p> <p>PROJECT: 116227035</p> <p>DATE: 9/26/13</p> <p>SCALE: AS SHOWN</p> <p>DESIGNED BY: JCK</p> <p>CHECKED BY: JCK</p>
<p>Kinley-Horn and Associates, Inc.</p> <p>4300 WALKER LANE, SUITE 200, WILMINGTON, DE 19802</p> <p>PHONE: 302-221-8800 FAX: 302-221-8801</p> <p>WWW.KH-AND-ASSOCIATES.COM</p>		

APPENDIX II

BORING LOGS



RECORD OF SUBSURFACE EXPLORATION

Virginia Beach
204 Grayson Road
Virginia Beach, VA 23642
757-518-1703

Williamsburg
1592-E Penniman Road
Williamsburg, VA 23185
757-564-6452

Elizabeth City
106 Capital Trace Unit E
Elizabeth City, NC 27909
252-335-9765

Jacksonville
415-A Western Blvd
Jacksonville, NC 28546
910-478-9915

BORING ID
B-1

PROJECT NAME: North King Street & Little Back River Road-Traffic Signal Poles

PROJECT NUMBER: WM14-104G

CLIENT: Kimley-Horn and Associates, Inc.

SURFACE ELEVATION (MSL) (ft): _____

PROJECT LOCATION: Hampton

LOGGED BY: J. Robinson

BORING COORDINATES: EAST: 0 NORTH: 0

DATE STARTED: 3/17/2014



DRILLING METHOD(S): Rotary wash "mud"

DATE COMPLETED: 3/17/2014

GROUNDWATER*: INITIAL (ft) ∇ : 7 AFTER _____ HOURS (ft) ∇ : _____

DRILLER: GET Solutions, Inc.

The initial groundwater readings are not intended to indicate the static groundwater level.

Elevation (ft)	Depth (ft)	STRATA DESCRIPTION	Strata Legend	Sample ID	Sample Type	Sample Recovery (in.)	Blow Counts (N-Values)	%<#200	TEST RESULTS																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																							
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Sample Type(s):

Notes:

SS - Split Spoon

This information pertains only to this boring and should not be interpreted as being indicative of the site.



RECORD OF SUBSURFACE EXPLORATION

Virginia Beach
204 Grayson Road
Virginia Beach, VA 23642
757-518-1703

Williamsburg
1592-E Penniman Road
Williamsburg, VA 23185
757-564-6452

Elizabeth City
106 Capital Trace Unit E
Elizabeth City, NC 27909
252-335-9765

Jacksonville
415-A Western Blvd
Jacksonville, NC 28546
910-478-9915

BORING ID B-1

PROJECT NAME: North King Street & Little Back River Road-Traffic Signal Poles

PROJECT NUMBER: WM14-104G

CLIENT: Kimley-Horn and Associates, Inc.

SURFACE ELEVATION (MSL) (ft): _____

PROJECT LOCATION: Hampton

LOGGED BY: J. Robinson

BORING COORDINATES: EAST: 0 NORTH: 0

DATE STARTED: 3/17/2014

DRILLING METHOD(S): Rotary wash "mud"

DATE COMPLETED: 3/17/2014

GROUNDWATER*: INITIAL (ft) ∇ : 7 AFTER _____ HOURS (ft) ∇ : _____

DRILLER: GET Solutions, Inc.

The initial groundwater readings are not intended to indicate the static groundwater level.

Elevation (ft)	Depth (ft)	STRATA DESCRIPTION	Strata Legend	Sample ID	Sample Type	Sample Recovery (in.)	Blow Counts (N-Values)	%<#200	TEST RESULTS									
									Plastic Limit	X	—	X	Liquid Limit	Water Content	●	Penetration	/	
		Orange/Gray, moist to wet, Silty fine to medium SAND (SM) with Clay and marine shell fragments, loose "Yorktown Formation" (layer continued from previous page)																
	25			9	X	24	3-4-3-5 (7)											
				10	X	24	4-5-4-6 (9)											
	30																	
				11	X	24	3-3-3-4 (6)											
	35	Boring terminated at 35 feet below existing grade.																

Sample Type(s):

SS - Split Spoon

Notes:

This information pertains only to this boring and should not be interpreted as being indicative of the site.

APPENDIX III

GENERALIZED SUBSURFACE PROFILE



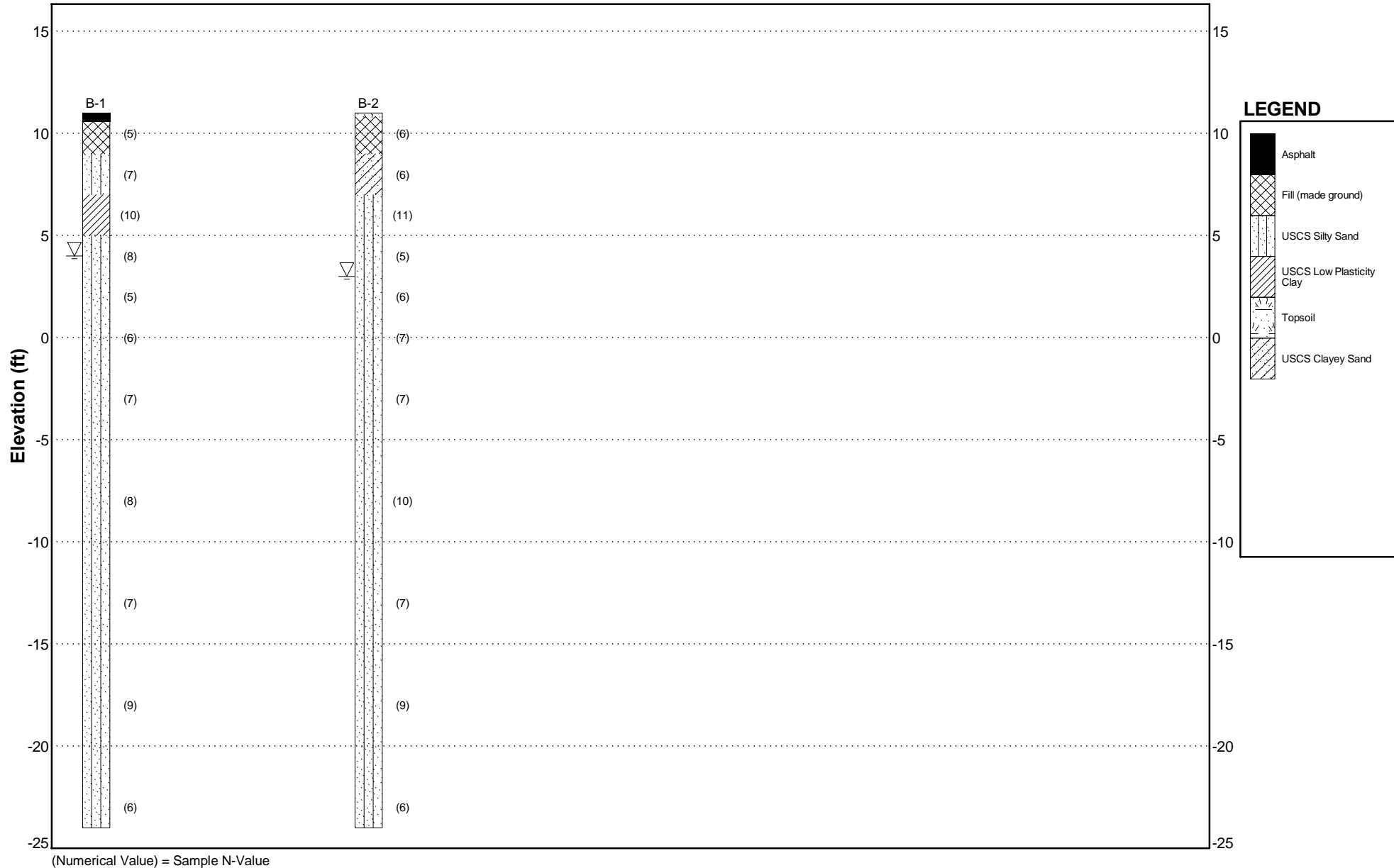
GENERALIZED SOIL PROFILE

PROJECT NAME: North King Street & Little Back River Road-Traffic Signal Poles

PROJECT NUMBER: WM14-104G

PROJECT LOCATION: Hampton

CLIENT: Kimley-Horn and Associates, Inc.

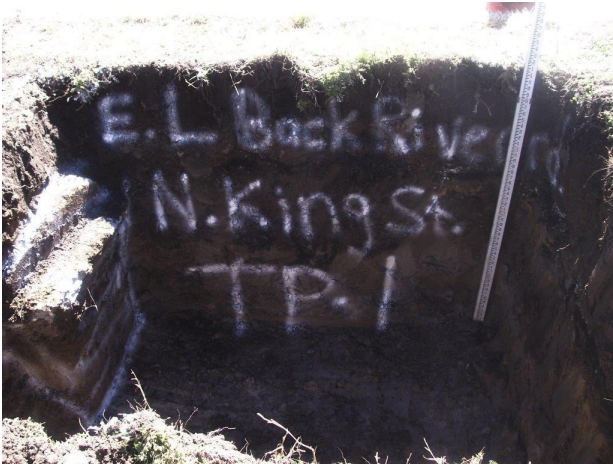


APPENDIX IV

PHOTOGRAPHS OF EXCAVATED TEST PITS

Photographs of Excavated Test Pits

Test Pit: TP-1



Test Pit: TP-2



**North King Street and Little Back River Road
Traffic Signal Poles
Hampton, Virginia
G E T Project No. WM14-104G**

APPENDIX V

GROUND PENETRATING RADAR REPORT



March 6, 2014

GET Solutions Inc

Attn: Joe Robinson

Site: N King St and Little Back River Rd (Hampton, VA)

Re: GPR survey for underground utilities

We appreciate the opportunity to work with you on your project in Hampton, VA.

GSSI SIR-3000

Ground penetrating radar was used to scan the requested area at the above address. When performing the survey I used a Geophysical Survey Systems Inc (GSSI) SIR-3000 Radar unit. This is the most advanced GPR unit currently available. It allows for onsite interpretation, as well as data storage for post processing. This equipment is self-calibrating, allowing more precise depth and location measurements. GSSI is a leading GPR designer and manufacturer. Information can be found at www.geophysical.com

400 MHz GSSI antenna

For this project, I used a 400MHz antenna with the SIR-3000. This antenna allows data collection to a depth of 6'-8' in the ground. The signal reflects on all objects which are a different conductivity from the substrate (soil). This reflection is what allows me to "see" into the ground. When interpreting the data, I am looking for an anomaly or a good hyperbola on the SIR-3000 screen. This is formed when the radar shoots an electromagnetic signal into the soil and the reflections in the soil sends back the signal to the antenna.

Survey Results:

On the morning of March 6, 2014 a GPR survey was conducted in and around a marked scan zone on Little Back River Road to ensure that known utilities were outside of the proposed penetration area. The survey revealed sewer/sanitation and water lines near the proposed area but not directly within it. As illustrated by the following site photos, the markings are well clear of the area in question. Findings and depths were marked on the surface of the road on the site. Scans were performed in a grid pattern at both north-south and west-east directions to eliminate all possible utilities from this area.

Jonathan Mappin - Project Manager of Virginia Beach, VA
Jonathan.mappin@gp-radar.com • (757) 319-1903

Conclusion:

The data was fairly clear and easy to interpret. All of my findings at the proposed location were marked directly on the surface with spray paint. If you have any questions or comments please let me know. I look forward to working with you on other projects in the near future. Screen shots and photographs of the locations are as follows:



Jonathan Mappin - Project Manager of Virginia Beach, VA
Jonathan.mappin@gp-radar.com • (757) 319-1903

